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ANY GOGGLES TODAY, MISTER?

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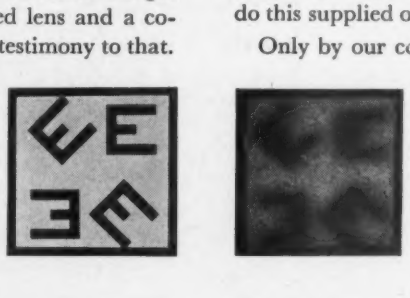

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**Figure based upon surveys made by the Better Vision Institute.*

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AMERICAN JOURNAL OF OPHTHALMOLOGY

VOLUME 19 MAY, 1936 NUMBER 5

MICROANATOMY OF THE EYE WITH THE SLITLAMP MICROSCOPE

1. Comparative Anatomy of the Angle of the Anterior Chamber In Living and Sectioned Eyes of Mammalia. Part I.

MANUEL URIBE TRONCOSO, M.D. AND RAMON CASTROVIEJO, M.D.
NEW YORK

This paper will be presented in three parts. Part I describes the material, method, and the observations made in Rodentia (rabbit) together with the summary, the illustrations, and the bibliography covering the entire paper. From the Institute of Ophthalmology, Columbia-Presbyterian Medical Center. Received for publication on June 18, 1934. Owing to the difficulties entailed in preparing and printing the large number of colored illustrations the publication of this paper has been greatly delayed.

The minute anatomy of the various tissues and structures of the eye in man and animals has been the subject of an enormous amount of work and critical discussion. The matter seemed to be quite definitely settled for the normal eye of man, at least, and the nature and relations of its parts as well as the details of form and reciprocal arrangement completely established; but, as frequently happens in medicine, with the advent of new methods of investigation, we are apt to enlarge our knowledge and detect many unsuspected errors of observation or judgment.

The basis of anatomical research has always been accurate observation and dissection. Gross or macroscopic examination has been supplemented and perfected by examination with the loupe, for the structures of the eye are too small for naked-eye exploration alone. However, as this proved inadequate to unravel all the details of the delicate and complex structures of the eye, the microscope came to the fore and took first place in the interpretation of anatomical details. Unfortunately, microscopical technique could show only lateral views of thin sections, and was usually incapable of rendering an adequate idea of the frontal aspect of the structures. When this was to be studied, it was necessary to reconstruct the parts by serial sections, which had then to be examined one after the other, entailing an enormous amount of long, tedious, and painstaking work. The so-called "surface" or "teased" preparations were not easy to make and sometimes it was difficult to obtain sufficient transparency to permit of a good examination. From thin sections one cannot obtain a good idea of the appearance, beauty, and architectural arrangement of certain ocular structures. Besides, the microscopical technique required the use of stains and fixatives, which considerably altered the natural aspect of the tissues, mummifying and distorting them. If it were possible to examine the component parts of the eye in a fresh condition, or at least as hardened specimens, under high magnification and proper illumination from in front, and also in sections and to correlate both, we should be able to gather more accurate information and understand better the appearance, proportions, and architecture of the various structures.

The new microscope for opaque bodies, the "Ultrapak" (Leitz), which permits the examination of specimens by incident, reflected illumination, instead of by transparency, has been used by some observers for physiological and pathological work (studies of human capillaries of the nailfold, rapid tissue diagnosis, and so forth). We

tested it also in comparison with the method we are about to describe. A section of the eyeball was placed over the stage and low and high magnifications used. The result was not satisfactory, for the view was good only in a given plane, and did not have sufficient depth nor range of observation for our purposes.*

We have applied the slitlamp apparatus, as a whole, to the study of the microscopical anatomy of the eyeball. Its principal advantages are: 1. The tissues and structures of the eye can be examined from in front and then from the side, and their whole architecture fully understood. 2. It gives a perfect method of anatomical and pathological research in three dimensions, in which the perception of depth is wonderfully clear and accurate. 3. The specimen keeps its normal coloring and neither staining nor fixative is necessary, aside from hardening solutions. 4. Different kinds of illumination, direct, indirect, or transillumination, and different intensities and forms of light can be used to considerable advantage.

As to previous attempts in this direction, we have found in the literature the following data: E. Redslob,[1] in studying the structure of the vitreous used a binocular microscope provided with the same objectives and eyepieces as is the corneal microscope, but having its optical axis in a vertical instead of a horizontal position. This arrangement, he states, is the same as that made by Zeiss for the microscope used by biologists, zöologists, and botanists. He placed the vitreous in a square glass jar, three sides of which were covered with black paper. The bottom was also covered with black paper except for a hole in the center to allow the passage of a beam of light from a microscope mirror, to illuminate the specimen. A 100-candle-power lamp was used. He also projected through the uncovered lateral wall of the jar the illuminating beam of the Gullstrand slitlamp. The specimen was placed upon the chin rest.

M. J. Schoenberg demonstrated before the Section of Ophthalmology of the New York Academy of Medicine, some specimens which were examined with the slitlamp. This was reported in the May, 1931, number of the "Archives of Ophthalmology" under the title of "A new method for studying the normal and pathological surface anatomy of the eye," but neither description nor paper was ever published.

A. Cowan and W. E. Fry[2] in their anatomical and histological examinations of the hyaloid membrane of the vitreous mentioned having observed their specimens of pig's and human eyes with the slitlamp, but gave no further details.

H. Arruga[2a] examined the subretinal liquid, in cases of detachment of the retina, with the slitlamp microscope. He placed a drop of the liquid in a cell made with three glass slides cemented together, the central one having a small vertical slit cut out. The cell was attached to the side of the head rest.

J. Moreno has lately employed the corneal microscope for the study of the anatomy of the zonula.[3] He suspended the corneal microscope from the horizontal bar of a heavy stand where it could swing at will and directed illumination from an ordinary photographic bank of lights (Romeis Lampe). The principal objection to this arrangement is the source of light, which does not provide sufficiently intense and concentrated illumination.

The anatomical method that we have devised not only supplements and perfects the ordinary microscopical procedures, but serves as an adequate means for demonstrating structure, and has established new facts and given new interpretations which may prove of considerable value. The same method of investigation with the slitlamp microscope has also been applied to pathological eyes, and has been found to be of considerable value when either a view of the ensemble with lower mag-

* After this paper was written one of us (R. Castroviejo) used the Ultrapak for the photography of the angle of the anterior chamber through the gonioscopic contact glass (Amer. Jour. Ophth., 1935, v. 18, June, p. 524). Later on he discarded the Ultrapak for the Gullstrand slitlamp provided with a special illuminating device (Trans. Amer. Acad. Ophth. and Otolaryng., 1935).

nification or the examination of the frontal and lateral aspects of the structures or regions at greater magnifications was desired. This method has also the advantage of permitting the examination of a pathological eye after it has undergone 24 hours of hardening, and does not require the use of stains nor fixatives.

Method

Technique of the examination. The slitlamp and corneal microscope are

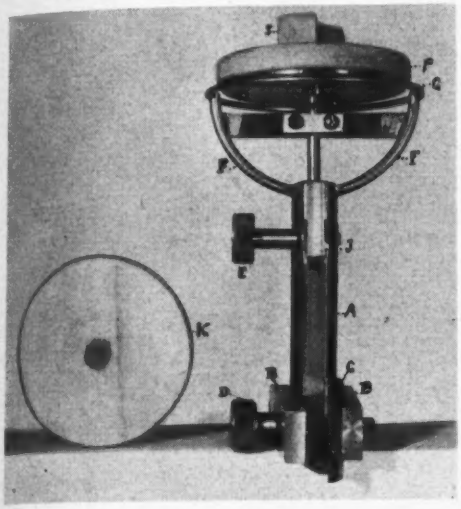


Fig. 1 (Troncoso and Castroviejo). Specimen holder for microanatomic investigation with the slitlamp microscope. The stage, P, is for dry specimens, which are placed on the concave stand, S, and secured with thumbtacks or pins. The flat stage, K, is substituted for P, to accommodate the glass jar when the specimens are examined under water.

used with the same technique as that for the examination of the living eye. In as much as the procedure is well known, we will not deal with it here, but will emphasize only that a complete mastery of the methods used for this examination conduces to better results in microanatomical investigation.

Material. Fresh human or animal eyes can be examined, at least in part, but it is preferable, in order to obtain better sections, to harden the specimen in 10-percent formol or other fluid. After 24 hours or more in the hardening solution, the eyeball is held between the

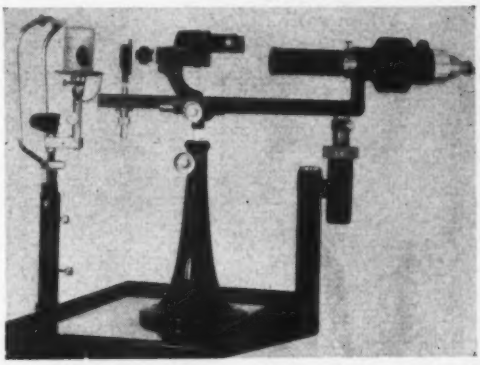


Fig. 2 (Troncoso and Castroviejo). The specimen holder attached to the chin bar of the slitlamp microscope. A bisected sheep's eye is contained in the glass jar which is placed upon the revolving stage of the stand. (The microscope is not in focus.)

thumb and index fingers and sectioned with a very sharp knife, a razor blade or a cataract knife, the latter being excellent for this purpose. A meridional

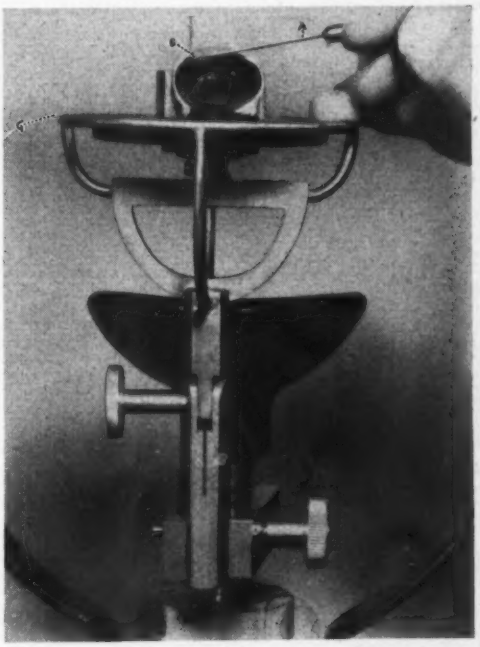


Fig. 3 (Troncoso and Castroviejo). Dissection of a pig's eye. The dry specimen is fixed to the stage with pins. The ciliary body has been detached with forceps from the sclera and a small piece of cotton introduced between the structures with the dissecting needle.

section is better for the examination of the cornea, anterior chamber, ciliary body, and lens. The best technique is to begin the incision at the equator. After perforating the sclera at a right angle with its surface, the knife is brought forward and gradually tilted in such a way that after cutting the ciliary body the edge will be almost vertical and may divide the iris at right angles to its surface, preferably with the tip of the knife avoiding the lens, which is very difficult to cut through. Then the cornea is severed to the center. The same maneuver is repeated on the other side. Lastly, the posterior segment is cut with scissors. The eyeball is then pulled apart until the zonula ruptures and one half is free while the other half still retains the lens.

Every effort should be made to obtain clean-cut sections (especially for the examination of the cornea, angle, and ciliary body), which will lie flat in contact with the glass wall. When both the vertical and horizontal meridians are to be comparatively examined, two sections are made in the eyeball at right angles to each other but both are terminated at the center of the cornea so that a wedge of the globe may be removed by slight traction. In this case, the lens usually stays in place and the lateral aspect of the zonula can be observed. The bisected eyeball may be examined either in a dry condition or under water.

Dry sections. To mount the specimen in a suitable position for observation, we at first used a cork placed on the chin rest of the slitlamp to which the section was pinned. This primitive arrangement was not satisfactory, in as much as it was very difficult to obtain a correct and steady position of the specimen at different inclinations and angles of observation. To meet these requirements we have devised the specimen holder represented in figure 1. It consists of a vertical shaft, A, to which are attached at right angles two horizontal bars, B, carrying a semicircular casing, C, which fits the threaded vertical stem below the chin rest of the slitlamp. A screw, D, allows an easy attachment or removal of the stand. In the middle of the shaft, A, is a joint, J, which permits movements in an anteroposterior plane, from the vertical to the 90-degree angle, the screw, E, keeping it at the desired position. At the top of the shaft there is a semicircular support, F,F′, which at its center upholds a wooden platform, P, revolving around its axis. A circular wire, G, runs around the edge of the platform supported by the curved stems, F,F′. A screw, in the back (not seen in the figure), keeps the revolving stage in any fixed position desired. The instrument is provided with two platforms, one a flat disc, the other bearing a support, S, concave on both sides to fit the convexity of the eyeball when examined directly. This is placed in the cavity and kept in place by thumbtacks or pins, pricked into the soft wood. The movement up and down is obtained by using the screw stem of the slitlamp below the chin rest. Lateral movements are

---

Fig. 8 (Troncoso and Castroviejo). Angle of the anterior chamber in a pig, as seen with the gonioscope. I, iris; PL, pectinate ligament; B, brilliant white line; A, band of pigment streaks; OR, circumcorneal pigment ring, seen by translucency; C, cornea.

Fig. 4 (Troncoso and Castroviejo). Angle in the rabbit as seen with the gonioscope. PL, pectinate ligament; B, yellow band corresponding to the corneo-scleral junction; OR, circumcorneal pigment ring.

Fig. 14 (Troncoso and Castroviejo). Gonioscopic aspect of the angle of the anterior chamber in a dark-coated dog. I, iris; PL, pectinate ligament; IP, inner pigmented band; OP, outer pigmented band; F, clear-cut edge of OP; Sc, sclera; C, cornea.

Fig. 19 (Troncoso and Castroviejo). Angle in a cat's eye as seen with the gonioscope. I, iris; PL, pectinate ligament; IP, inner pigment band; Sc, corneal insertion.

Fig. 15 (Troncoso and Castroviejo). Gonioscopic aspect in a light-coated dog. Letters have the same significance as in figure 14.

Fig. 22 (Troncoso and Castroviejo). Angle of the anterior chamber in a monkey (Macacus rhesus) as seen with the gonioscope. I, iris; R, last roll of the iris; CB, ciliary-body band; CS, Schlemm's zone; Sc, sclera; C, cornea.

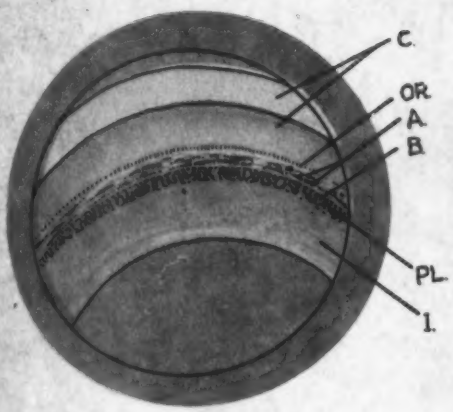


Figure 8

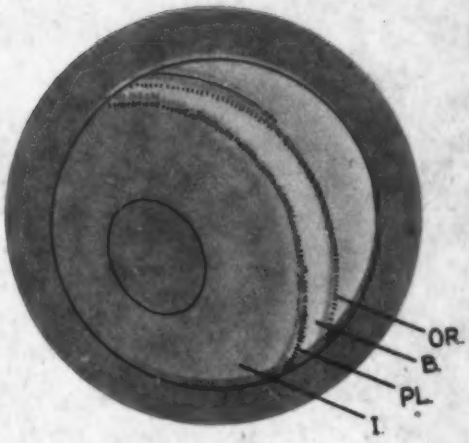
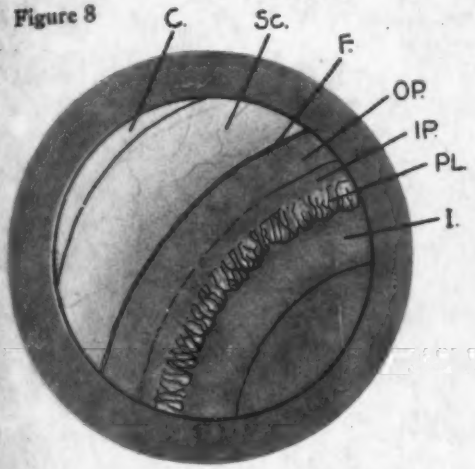


Figure 4



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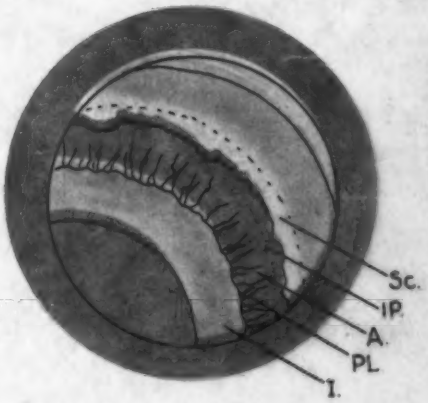
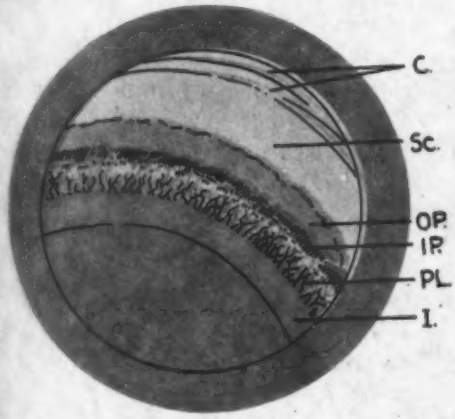


Figure 19



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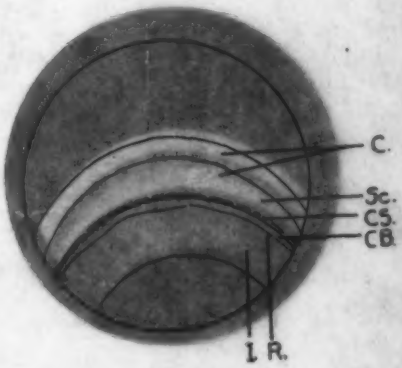

Figure 22

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easily and quickly made by turning the platform around its center. The wire circle, G, serves the purpose of giving the observer's fingers a point of support during the dissection of the eye (fig. 3) as will be mentioned later. The revolving platform has also the advantage of permitting the change of the plane of examination to a different angle. This is very convenient in the dry specimen in which a specular reflection due to a thin layer of liquid, or after desiccation, is often produced. A gradual rotation of the stage or a change in the position of the light dispels this troublesome reflex. The liquid may also be absorbed by laying the section flat upon a blotter.

Examination under water. For the study of minute details on both sides of the section and for demonstration purposes, it is convenient to place the specimen in a square glass jar, built with thin plates of a very transparent and optically perfect glass. We have found the absorption jars used for spectroscopic work especially useful, as their walls are thin, smooth, and of uniform thickness (fig. 2). The edges of the section should be kept well applied against the glass plate by pressure. For this purpose, we at first used a piece of cotton wedged tightly between eyeball and glass. Latterly we have employed a strip of celluloid in which has been made a circular perforation the size of the eyeball (about 19 mm. for human eyes and smaller or larger for animal eyes). The specimen is placed inside the hole and the strip pressed down by the cover so that by its elasticity it forcibly keeps the section in place. When two specimens are shown in the same jar, the strip of celluloid is made longer and with two holes. It is then bent in such a way that the tips point downward.

When the specimen is in position, the jar is filled with the liquid chosen. At first we used a dilute solution of formalin, but as long immersion in this fluid causes shrinkage and decoloration of the tissues, we have utilized to considerable advantage the following solution recommended by Mr. Burchell (New York Eye and Ear Infirmary):

Pick's Modification of Kaiserling Fluid

Water	225 c.c.
Glycerine	160 c.c.
Sodium acetate	67.5 grams
Formalin	4 c.c.

This provides a solution containing about 1 percent formalin and about 20 percent glycerine.

The glass cover is then cemented to the jar with warm Mayer's cement.

One advantage in using this preserving solution is that the specimen may remain exposed to daylight without undergoing any change or deterioration.

For examination under the slitlamp microscope, the jar is placed upon the flat platform of the specimen holder (fig. 2), which is adjusted to the central pin instead of the stage carrying the curved supports. The jar should be placed so that the side with the section is at right angles to the objectives. The specular reflections on the surface of the glass, which are particularly annoying, can be avoided by changing the position of the source of light to a more acute angle, or by slightly turning the platform around.

Observation under water is not so desirable as the dry examination when a dissection of the specimen is attempted, or when the investigation is made at different planes and at different lateral angles.

Dissection. After the frontal study of the bisected eye and the investigation of its borders has been completed, it is very important to obtain a better idea of the interdependence and mutual relations of the structures by a methodical dissection. In fact, this is one of the principal advantages of the method; it allows a separation of organs and a distinction between continuity and simple apposition to be made which are most illuminating. It is done by dissociating or stripping the structures and exposing the deeper parts, studying them, so to speak, layer by layer, until the framework has been laid bare.

Sometimes it is necessary, in order to secure a good view, as in the case of the angle of the anterior chamber, to push down the iris or to stretch it, or to draw away the lens or the membranes. This is accomplished by using

probes (fig. 3, A), forceps, or hooks which may be fastened to the iris or other membranes. To keep these in the required position the hook should be anchored to the eye itself or to the stage. Sometimes a wedge of suitable size made of cardboard or a piece of cotton (fig. 3, C) can be inserted between the parts, to separate them permanently. The stripping is done by tearing or cutting. The iris is torn by pulling with a forceps which holds it at various levels according to the degree of traction exerted. The pectinate ligament breaks down and its fibers come away with the ciliary body in part or in whole. In animals the deep sinus gapes and its surfaces are exposed to view. The lower part of the ciliary body may be detached entirely by pulling upon it. All these maneuvers must be made under the microscope, while supporting the fingers that hold the instrument upon the circular wire (G, fig. 3) which encircles the stage.

With relative facility we have probed Schlemm's canal in human eyes, using the fine wire of a hypodermic needle, which is suitably curved and applied to the opening of the canal under the guidance of the microscope. A slight push causes the wire to enter the aperture and slide inside the canal, where it is seen by translucency (fig. 32). The insertion should be short, otherwise the wire promptly perforates the trabeculum.

Stains. We have tried to stain the sections with methylene blue and with carmine solutions. With a fine hypodermic needle, a droplet was deposited on the place to be studied and the specimen then washed in alcohol. In general, staining the tissue does not bring out more details. However, we found it of advantage in differentiating some structures, as for example, Schlemm's canal in small monkeys (Macacus). Further study is necessary in this field of research.

Magnification. To obtain a comprehensive view of the whole field, a low magnification (×15) is convenient, but in order to observe the fine details of the structures a ×30 or ×40 is necessary. Higher magnifications can be used preferably in wet specimens, well prepared and in strong light.

Gonioscopy. The examination of the angle in living animals is made with the same technique as for man.[4] The animal is anesthetized and held in a convenient position. It is better, especially in small animals, to perform a canthotomy on both sides and remove the third lid, which is much in the way. The contact glass is then applied to the cornea and the air bubble removed as usual. We have used both the gonioscopic glass C and the ordinary Koeppe glass with the cavity above, the latter in small eyes, because the G glass is too large and the manufacturer has not yet made one suitable for smaller palpebral apertures.

After the gonioscopic examination had been concluded the eye was enucleated. In some cases we looked at the angle again, with the instrument, while the cornea was still transparent, by

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Fig. 5 (Troncoso and Castroviejo). Meridional section of a white rabbit's eye. C, cornea; OR, circumcorneal pigment ring; OR', the same ring seen by translucency through the cornea; B, yellow band corresponding to the corneo-scleral junction; Sc, sclera; N, longitudinal fibers (cribriform ligament) partly detached from sclera; AC, attached, and DC, detached portion of ciliary body.

Fig. 6 (Troncoso and Castroviejo). Meridional section of a black-coated rabbit's eye. The iris is drawn down by a hook. The letters have the same significance as in the preceding figure.

Fig. 16 (Troncoso and Castroviejo). Section of the same eye as in figure 14 as seen with the slitlamp microscope (×30). Vertical meridian. Letters have the same significance as in former figures. K, scleral spur; H, insertion of attached portion of ciliary body to sclera; O, end of suprachoroidal space.

Fig. 20 (Troncoso and Castroviejo). Section of a cat's eye in the vertical meridian. C, cornea; IP, inner pigment band; OP, outer pigment band; A, inner layer of intrajunctional pigment; B, outer layers of same; PL, pectinate fibers, which also fill the cavity of the sinus, S.

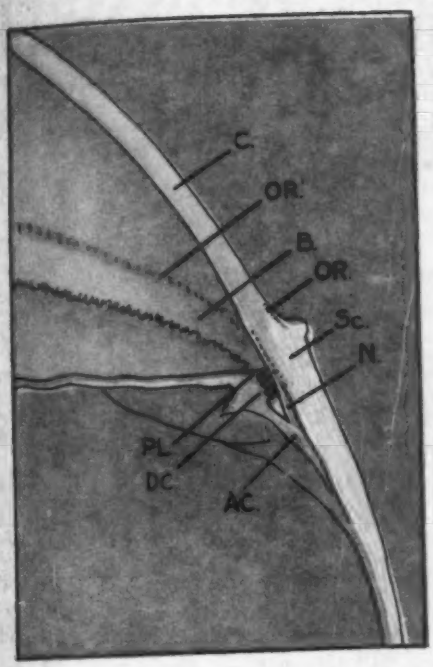

Figure 5

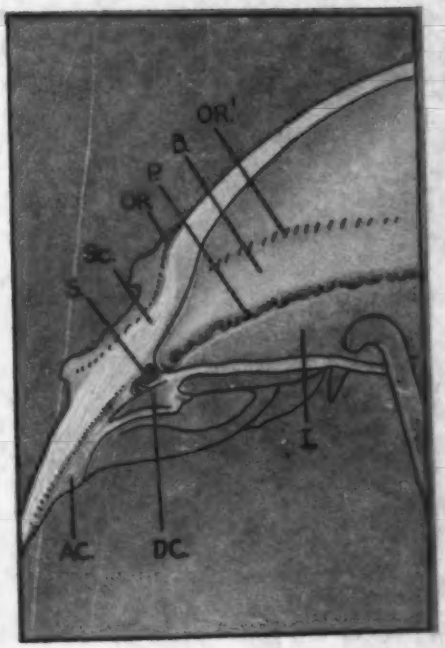

Figure 6

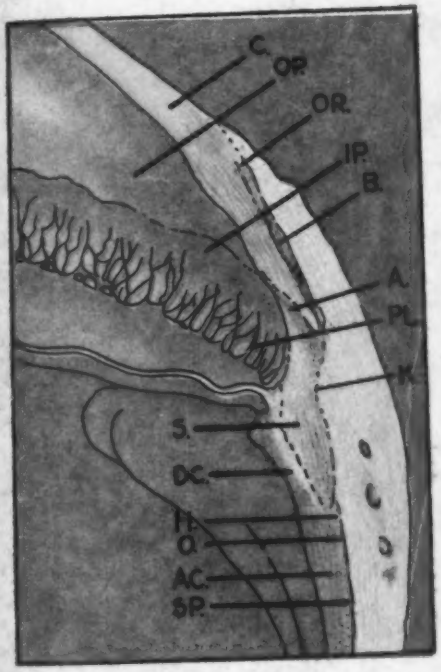

Figure 16

Figure 20

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placing the eye at the rim of a cup filled with wet cotton and applying the contact glass above. Even in hardened specimens it is possible to use the gonioscope by removing a large segment of the cornea and looking directly at the angle.

The angle of the anterior chamber in Mammalia

The anterior chamber is the space between the cornea in front and the iris and central part of the lens behind. The acute angle resulting from the junction of the corneo-scleral limbus with the iris and the ciliary body is called the angle of the anterior chamber. The anatomy of the angle proper is intricate and varies considerably in the different families of mammals. It cannot be fully understood and interpreted, especially in primates and man, unless a comparative study of the region in the ascending scale of Mammalia shows the original disposition and further development of the structures as they become adapted to the different requirements of physiological functions.

The angle of the anterior chamber had never before been observed in living animals. Only microscopical sections, which do not give a good idea of the frontal aspect and arrangement of the parts, have been studied. It was important to examine the angle in the living from the standpoint of comparative anatomy and physiology, on account of its rôle as outlet for the liquids of the eye. We used the gonioscope with the technique just described.

After the gonioscopic examination, the eye was enucleated and immediately placed in 10-percent formalin solution for later microanatomic investigation. In this way, we could easily correlate the image of the angle during life with the anatomic findings, both by a frontal and a lateral examination with the slitlamp, using the same and higher magnifications than those available with the gonioscope.

Classification. The architecture of the angle varies greatly in Mammalia. T. Henderson[5] and others have divided this class into three groups: Herbivora, Carnivora, and Primates including man. There are however, distinct anatomical differences between some of the orders of the first group, which make it necessary to follow a more accurate zoölogical classification.

We have studied only some of the more important animals in the four orders of the Monodelphia (Placentalia).

In the mammals with claws, Unguiculata, we have observed only the Rodentia (rabbit); in the mammals with hoofs, Ungulata, the pig, sheep, and cow; in the group of Carnivora, the dog and cat, and in the Primates, the rhesus monkey, the chimpanzee, and man.

T. Collins[15] and Henderson[5] think there is an ascending scale of evolution of the ocular apparatus in these orders. In the Herbivorae there is a marked divergence of the optical axes, which decreases in Carnivorae and leads to parallelism in Primates. These differences in the position of the optical axes are associated with marked changes in the range and power of accommodation, according to the work the eye is called upon to perform and befitting the functional needs of the species.

The structures of the angle, including the whole ciliary body, are suited to the performance of two principal functions: the exit of the ocular fluids and the accommodation of the lens to provide for vision at various distances. For the best interpretation of the conditions under which the former takes place, a study of the comparative anatomy of the region of the angle is of paramount importance. We will limit ourselves for the present to the gonioscopical and microanatomical investigation of the angle proper, leaving for future papers the complete study of the processes, lens, zonula, and other parts.

I. RODENTIA

1. RABBIT.

Gonioscopy. In order to apply the contact glass it is necessary, in the anesthetized animal, to perform a canthotomy on both sides and remove the third lid.

The angle in the rabbit is very narrow and difficult to see, due to the prominence of the iris, with the pupil

well forward near the cornea. In dark-coated rabbits the angle appears at first glance to be similar to that in man, the border of the iris being separated from the sclera by a dark-brown band. After accurate focusing, however, it is seen that the band resolves itself into a number of small, stout, fibers of the same color as the iris or darker (PL, fig. 4). They are conical or cylindrical in shape, with their bases attached to the serrated edge of the iris. They are spread in an almost horizontal direction and closely resemble the teeth of an inverted comb. Their background is white in albinos and dark brown in dark-coated rabbits.

These teeth were observed first by Hueck (1839) in Ungulata (cow) and called by him *ligamentum pectinatum* (pecten, a comb).

Microanatomy:* After the gonioscopic examination the eye was enucleated, hardened in formalin and sectioned as previously stated.

The angle was observed first from in front in a dry specimen mounted in the special stand (fig. 1), using ×15 and ×30 magnifications, and then examined at the edge of the section, first under diffuse and then under more and more concentrated light. The comparison between the frontal and the lateral aspects is most illuminating. The section is then examined under water, where desiccation does not change the appearance of the structures and where the specimen may be kept indefinitely for further study.

Proceeding systematically we shall study:

(1) *The sclero-corneal junction.* The limit of both membranes is very clearly seen in the section especially in specimens under water. It is different in the vertical and horizontal meridians. In the former (fig. 5), the cornea joins the inner scleral slope, Sc, in a very long slant and descends to the level of the iris. The sclera extends upward to a pigmented circumcorneal ring, OR, running below the conjunctival insertion. In the horizontal meridian the slant of the cornea is shorter, the junction being almost horizontal (fig. 6). There is usually some pigment at the tip of the corneal wedge. Descemet's membrane is very apparent as a transparent, glassy membrane which does not stop at the level of the upper teeth of the pectinate, but runs down to the middle of the sinus.

(2) *The angle.* The anterior chamber is wide, but the angle is reduced by the great prominence of the iris. This membrane has to be depressed with a probe or a hook so that the teeth of the pectinate ligament may be seen from in front, especially their insertions into the edge of the iris. Under higher magnification of the biomicroscope other fibers are seen at deeper levels. The superficial ones are stouter and cylindrical or conical in shape. Many fuse at their base into a broad root and then the branches separate to be attached almost horizontally to the sclera (figs. 5 and 6, S). Their background is different, as has already been mentioned.

Following the yellowish-white band, B, to the edge of the section, it proves to be the sclera, Sc, seen through the transparent corneal slant. The pigment line, OR, is due to the outer circumcorneal pigment ring, OR′, which is seen by transparency through the thin corneal membrane.

(3) *The cilio-scleral sinus.* Hueck did

* In the following descriptions the bisected eye is considered as lying with the apex of the cornea upwards. This has been done for the purpose of comparing the findings by microanatomy with the gonioscopic picture, which is always seen with the patient lying down, or the animal turned to one side. The specimen, however, can be accommodated upon the stand or jar in any other desired position.

Fig. 7 (Troncoso and Castroviejo). Dissection of a rabbit's eye. The iris is drawn well backward. Letters signify the same as in the preceding figures. T, longitudinal fibers of pectinate ligament; D, Descemet's membrane.

Fig. 10 (Troncoso and Castroviejo). Dissection a pig's eye. Horizontal meridian. Dry preparation. The iris pulled downward and inward. The letters have the same meaning as in the other pictures. M, ciliary muscle attached to sclera by tendon at the level of T; N, detached outer wall of sinus; O, ball of cotton.

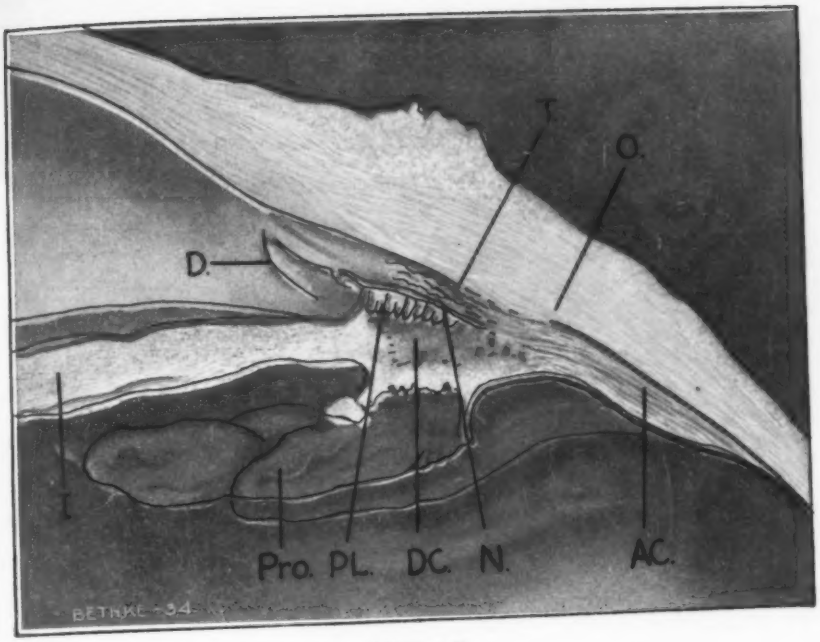

Figure 7

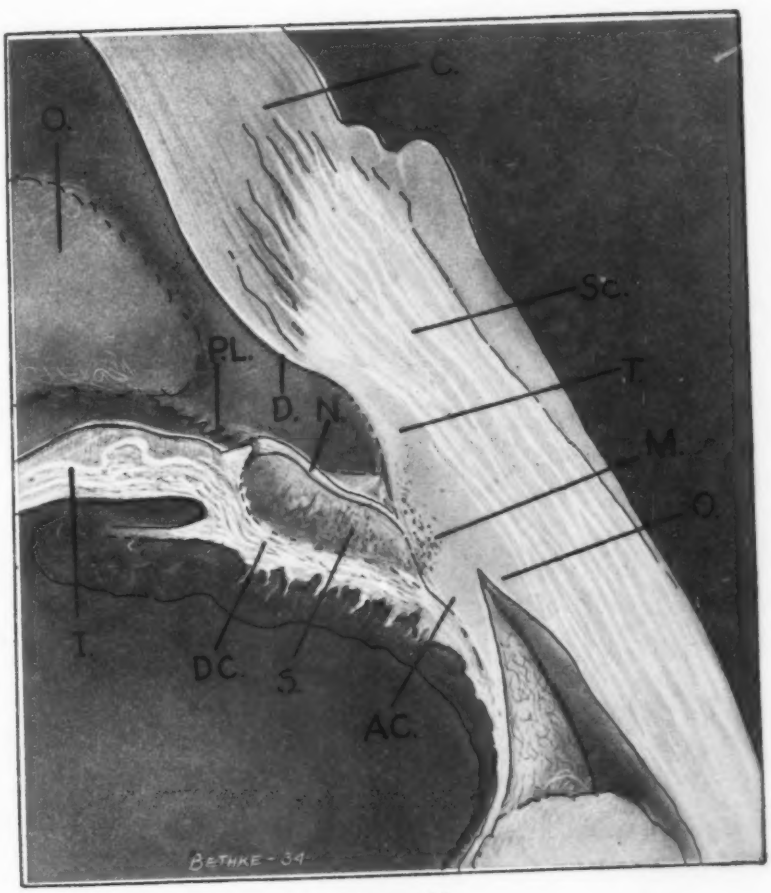

Figure 10

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Fig. 9 (Troncoso and Castroviejo). Section of the eye of a light-coated pig under high magnification (×30). Vertical meridian. C, cornea; I, iris; D, Descemet's membrane; SC, sclera; P, pectinate ligament, upper fibers; S, cilio-scleral sinus; DC, detached portion of the ciliary body; AC, attached portion of the ciliary body; M, ciliary muscle; T, tendon.

Fig. 28 (Troncoso and Castroviejo). Meridional section of a human eye (×30). The iris has been pushed down by a piece of cardboard which stretches the fibers of the pectinate, PL, bridging the sinus, S. Schlemm's canal, CS, is very conspicuous; T, corneal or sulcus trabeculum, clearly showing its thickness and loose, spongy aspect.

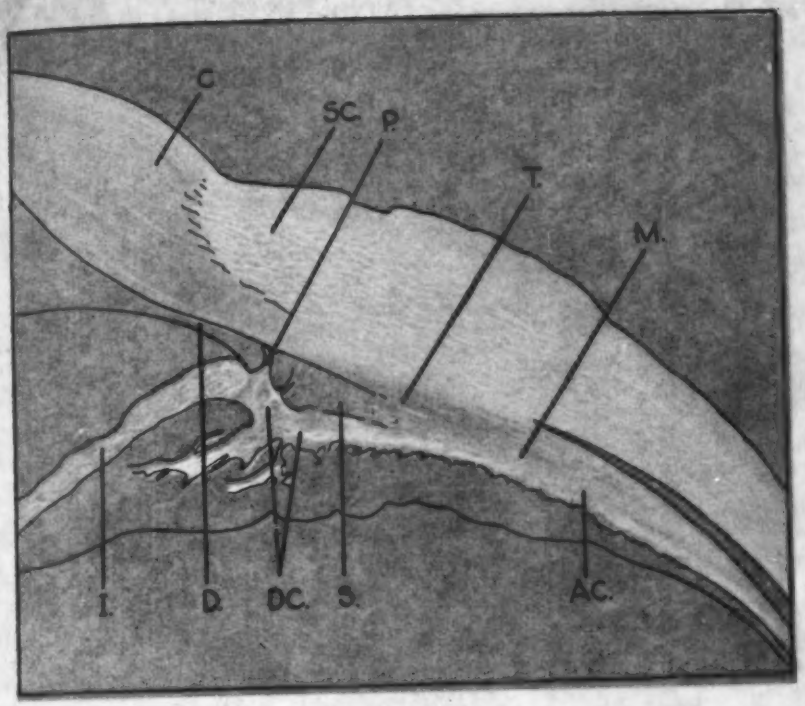

Figure 9

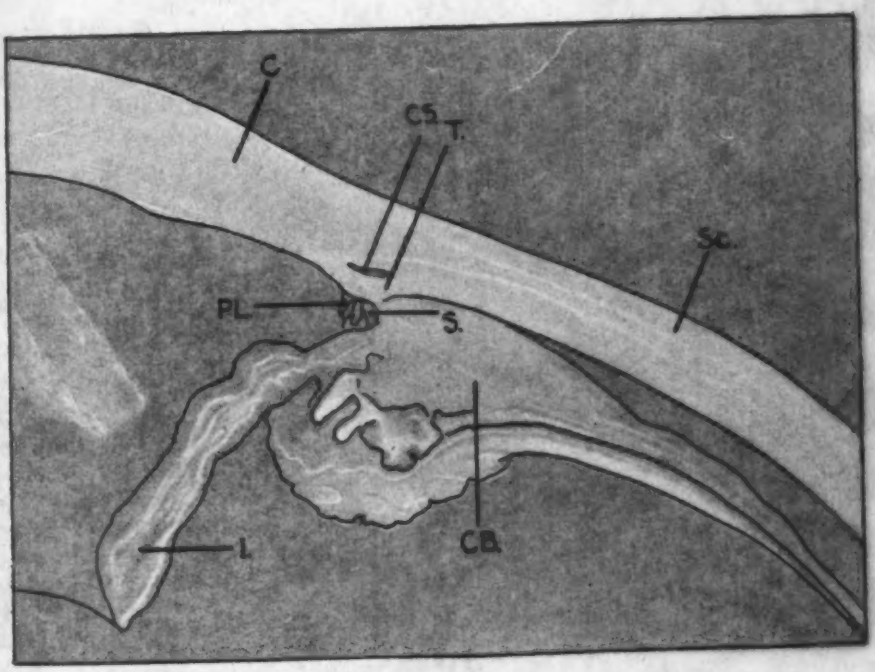

Figure 28

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not see what was below the strands of the pectinate ligament. F. Fontana (1805) found, in the cow, that below the superficial strands there were others separated by spaces which he described as a canal, hence the inadequate and confusing name, still used by many authors, of "Fontana's spaces." With the slitlamp the section shows beautifully a cleft separating the sclera from the root of the iris and ciliary body, which may aptly be called "the cilioscleral sinus." In the section (figs. 5 and 6) it has a triangular shape and is filled with several rows of stout, conical, pigmented fibers of which the upper ones, called the "suspensory ligament of the iris," are the stouter, tapering to a fine point toward the sclera. The lower are almost of the same thickness, parallel to each other, and run from the ciliary body, to which they are attached by broad bases (fig. 5, PL), to the scleral wall. The bottom of the sinus is sometimes a rounded space, at other times the fibers grow there more numerously and interlace forming large spaces "resembling grossly the spongy tissue found in Ungulata (see p. 382).

The spaces between these fibers, the so-called spaces of Fontana, are of various sizes. Sometimes the upper space is wider (fig. 6) and it has been mistakenly described by Rochon-Duvigneaud, Maggiore, and others, as an individual canal, but a larger space can also be seen in the middle or in the lower part of the sinus (fig. 5). In good, clear-cut sections and under high magnifications it is easy to differentiate a second set of white longitudinal fibers (N, fig. 7) which are parallel to the sclera and into which are inserted the tips of the pectinate. In figures 5 and 7, this bundle, N, has been partly detached from the sclera and is seen above in direct connection with the end of Descemet's membrane, while below it merges with the attached portion of the ciliary body. It makes up the continuation or tendon of the ciliary muscle and has a meshwork structure (cribriform ligament of Henderson). We shall deal with it further. The sclera increases in thickness from the conjunctival insertion downward. At a level with the bottom of the sinus it forms a slight prominence, a scleral spur (not visible in the figures), and then thins down to the posterior segment, becoming narrower than the cornea.

The iris is a thin, fibrous-looking membrane, which is directly inserted by a broad base into the ciliary body. This is divided by the cleft into two portions, one (DC, figs. 5 to 7), carrying the processes, is a strip of tissue the inner limitation of the sinus. As it appears to be in direct continuation with the iris it has been called by Lauber the "iridic part of the ciliary body." The other portion of the ciliary body is attached to the sclera and has been called the "scleral part." T. Henderson considers the former also to be a prolongation of the iris and designates it "the fibrous base of the ciliary processes." In our opinion the iris anatomically and functionally is a structure different from the ciliary body. To designate the latter in a shorter and more descriptive way we would call the upper strip the *detached* and the lower the *attached* portions of the ciliary body. When the section passes through a process, the ciliary body appears to have an almost triangular or square shape, which resembles to a certain extent its human counterpart. The attached part of the ciliary body thickens again (AC, fig. 7) before it joins the choroidal coat.

The ciliary processes are large and extend to the posterior surface of the iris, reaching almost to the pupil. The lens is of great size and spherical.

Dissection. Upon pulling the iris in with a forceps, the teeth of the pectinatum are stretched and the small sinus is enlarged, showing well the white or pigmented background of the fibers, according to the color of the animal. The traction continuing, the upper tips of the pectinatum are detached (fig. 7), carrying with them a thin slice of semitransparent tissue, a part of Descemet's membrane, D. Upon pulling still more, the whole sinus is separated, showing at the bottom the insertion of the detached part of the ciliary body. Examining the ciliary wall, it is easy to see that the whole cluster of teeth has remained in position, being adherent to

a semitransparent, longitudinal tissue membrane (N, figs. 5 and 7), which lines the outer sinus wall and loses itself below in the attached ciliary body.

Between this membrane and the sclera appear numerous longitudinal fibers (T, fig. 7) broken at the sclero-corneal insertion and loosened by the separation of the whole sinus. They belong to the tendon, T, which has, besides, a wide insertion at the sclera from T to O, the latter being the end of the suprachoroidal space. These longitudinal fibers are fenestrated and attach themselves above to the end of Descemet's membranes and the tip of the corneal wedge. They are different from the lining membrane, N, and may be called with Henderson "cribiform ligament." They are considered the principal tendon of the ciliary muscle but, as we shall see later, are probably only a check ligament.

The ciliary wall is brown and pigmented, while the scleral shows its white surface at the site of the sinus and then becomes pigmented below. No vessels are seen in its substance. Even with the microscope they may appear in some sections below the longitudinal fibers (the so-called "sclero-corneal trabeculum" of Davis), but according to Maggiore it is necessary to examine numerous slides or whole sectors of the globe to find any.

Summary

The authors have used the slitlamp microscope for the anatomical investigation of the anterior segment of the eye, especially the angle of the anterior chamber, in Mammalia. After examining the angle in living animals with the gonioscope, they enucleated the eyes and studied them by microanatomical methods with the slitlamp. They point out the advantages of observing the structures from in front under high magnification, instead of the ordinary method of reconstruction by serial sections which must be examined, sometimes by the hundred, to obtain a clear idea of the architecture of the region. With the slitlamp the frontal aspect is strikingly beautiful in Mammalia. Besides, by following the tissues to the edge of the bisected eye, the interpretation of the arrangement of the structures and of their mutual relations is much better understood. The authors have used dry preparations, placing the specimens in a special stand devised by them, which can be adjusted for observations in any plane, and is attached to the stem of the chin rest of the ordinary slitlamp. They also used wet preparations, placing the specimens under water in special square jars of perfectly optical, thin glass.

The same technique was used also for pathological specimens with strikingly good results.

In addition to examination by the two methods, dry and wet, they emphasize the importance of making a careful dissection of the specimens under the microscope, tearing and separating the various structures, layer by

Fig. 11 (Troncoso and Castroviejo). Section of a sheep's eye. Horizontal meridian. Magnification ×15. J, corneo-scleral junction.

Fig. 25 (Troncoso and Castroviejo). Section of a chimpanzee eye. I, iris; D, last roll of iris; IR, iris root; PL, pectinate ligament (suspensory ligament of iris); S, sinus filled with the finer strands of the pectinate; CS, Schlemm's canal; T, sulcus or corneal trabeculum; CB, ciliary body; C, cornea; Sc, sclera; OP, outer pigment ring. The conjunctiva is wholly pigmented. K, scleral spur.

Fig. 24 (Troncoso and Castroviejo). Section of a rhesus monkey's eye under higher magnification (×30). I, iris; PL, pectinate ligament (the fibers instead of being taut, have slackened due to a lateral movement of the specimen inside the jar). PL′, fibers of the pectinate filling the small sinus or depression on the concave border of the ciliary body, CB; B, acute edge of the corneal wedge into the sclera; CS, Schlemm's canal; T, sulcus trabeclum (sclero-corneal trabeculum). The longitudinal fissure inside of Schlemm's canal is an artefact by separation of the fibers.

Fig. 23 (Troncoso and Castroviejo). Section of the same eye as in figure 22, with the iris pulled down (×15). A, upper end of the suprachoroidal space filled with a large amount of pigment; B, rounded edge of the cornea; OP, outer pigment ring (the whole conjunctiva is heavily pigmented in this animal); C, cornea; CB, ciliary body; PL, pectinate ligament; I, iris. Schlemm's canal is not visible in this section.

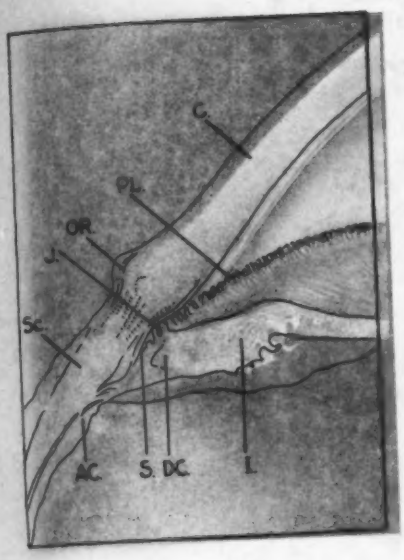

Figure 11

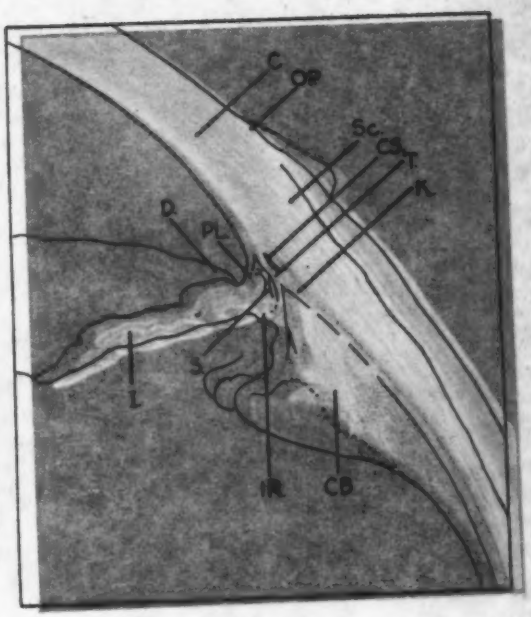

Figure 25

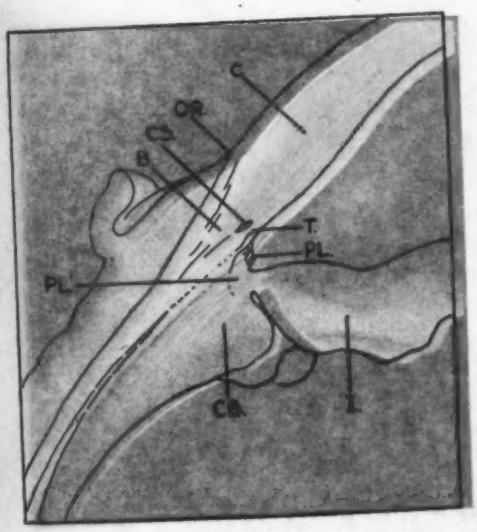

Figure 24

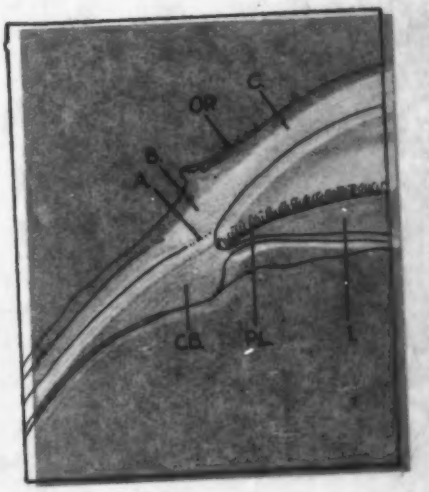

Figure 23

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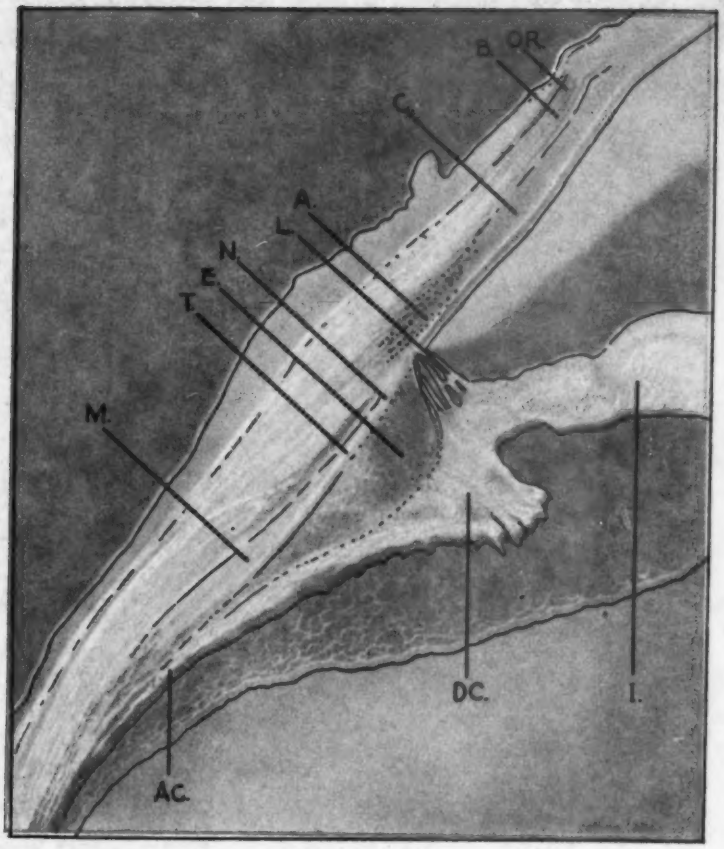

Figure 12

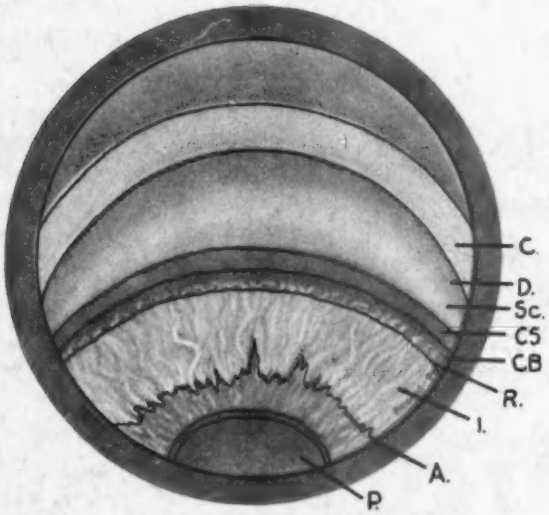

Figure 26

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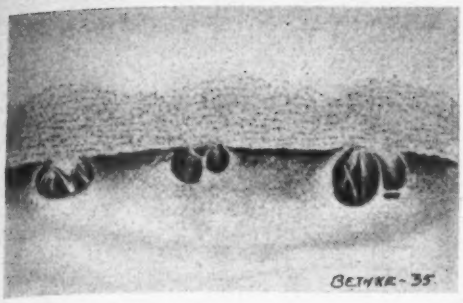

Fig. 11 bis (Troncoso and Castroviejo). Angle of a sheep's eye as seen from the front. It shows the teeth of the pectinate ligament fused together in large membranes, attached directly to the sclera. Between them are oval holes through which the deeper fibers of the pectinate ligament are visible. In the corneal wall numerous streaks of brown-black pigment are disposed in horizontal rows.

Fig. 27 bis (Troncoso and Castroviejo). Section of a human eye showing the corneo-scleral junction.

layer, and studying their mutual relations. With some care they have been able to probe Schlemm's canal with the fine wire of a hypodermic needle and by dissection to observe the structure of the trabeculum in a flat preparation.

The angle of the anterior chamber in Mammalia differs with the various orders. Amongst the Monodelphia (Placentalia) the following were studied: Rodentia (rabbit), Ungulata (pig, sheep, and ox), Carnivora (dog and cat), Primates (Macacus rhesus and chimpanzee), and man.

In the first three groups, the angle seen from in front both with the gonioscope and by microdissection shows beautifully the pectinate ligament as a series of parallel strands resembling a comb (pecten), which attaches the iris root to the inner part of the sclera. They are different in size, arrangement, and position, according to the orders. In Rodentia (rabbit) the pectinate is made of short, stout, conical fibers (Figs. 5 and 6). At the border, the section discloses several parallel rows of horizontal fibers attaching the iris to the wall (fig. 5, PL), and leaving between them spaces which have been called "Fontana's spaces." The earlier anatomists believed that these larger spaces were actually a canal around the limbus, "Fontana's canal." Microdissection shows that there is not a canal but a cleft, a sinus, between the sclera and the ciliary body, for which the authors propose the name of cilio-scleral sinus. In the rabbit besides the pectinate there is a bundle of longitudinal fibers (N, fig. 5) which are the continuation of the tendon of the ciliary muscle and merge upwards with Descemet's membrane and corneal tissue. They have a meshwork structure.

The ciliary body is made of two parts, the upper one (with the specimen placed as in gonioscopy with the cornea

Fig. 12 (Troncoso and Castroviejo). Section of a sheep's eye, vertical meridian. Magnification ×30. A, intrajunctional pigment at tip of cornea; B, same at scleral border; OR, circumcorneal pigment ring; L, stout fibers of the pectinate or "suspensory ligament of iris"; E, spongelike, pigmented fibers of pectinate; N, bundle of longitudinal fibers lining the external wall of sinus; T, tendon; M, ciliary muscle; AC, attached part of ciliary body; DC, detached part of ciliary body.

Fig. 26 (Troncoso and Castroviejo). Angle of the anterior chamber in man as seen with the gonioscope. Normal eye. P, pupil; A, lesser circle of the iris; I, iris; R, last roll; CB, ciliary-body band; CS, Schlemm's zone or band; Sc, inner part of the limbus, the white sclera showing through the transparent corneal bias; C, cornea. D, Descemet's membrane. The longitudinal radiations in the iris are very prominent in this eye and end in loops above the ciliary body. This is not a common feature in gonioscopy.

upwards) continuous with the iris is the "iridic" (Lauber), or better, detached portion of the ciliary body, while the lower is inserted into the sclera, the attached or "scleral" part of the ciliary body.

In Ungulata (figs. 8 to 13), the first row of teeth of the pectinate, which is almost horizontal, has been called the "suspensory ligament of the iris." Below it are numerous and finer filaments, which in the microscopic descriptions of this region have been greatly confused. With the slitlamp and a magnification of at least 30 diameters the arrangement of these fibers is beautifully shown as a spongelike or cavernous tissue, covered with dots of pigment which entirely fill the sinus (figs. 9 and 12). There is, besides, another set of longitudinal strands which runs from the insertion of the ciliary body to the sclera forward, and attaches itself to the end of Descemet's membrane. This is the tendon of the ciliary muscle and has been considered by some authors similar to the sclero-corneal trabeculum in man (the "cribriform ligament" of Henderson). In dissection under the microscope, after tearing off the iris, the pectinate teeth break loose carrying with them the whole sinus, but the attached ciliary body resists and with a needle it is easy to see that it is firmly inserted into the sclera from the end of the suprachoroidal space to a point near the lower apex of the sinus. The writers contend that this is the principal insertion of the ciliary muscle and corresponds to the scleral spur. It gives also a firm support to the enormous spherical lens. The longtitudinal fibers, N, are only a check ligament or, better, an elastic, retaining ligament of the muscle which helps to keep the muscular fibers in proper position during contraction.

In Carnivora the arrangement is different, the strands of the pectinate are thinner and disposed in a vertical direction (figs. 14 to 21). The first two rows of these fibers are stouter and give support to the iris root. Below them the sinus is filled with innumerable, fine, white threads, having a meridional arrangement (figs. 16 and 20). No spongy tissue is present in Carnivora. There is also a third bundle of longitudinal fibers, which, as in Herbivora, acts as a retaining elastic ligament to the muscle, and also lines the sinus outwards. The ciliary body has the same arrangement as in Herbivora. The great depth of the cilio-scleral sinus is in relation to the capacity of the anterior chamber, which is very large in lower Mammalia.

Inside the scleral wall of the sinus is a venous plexus which is known as "Schlemm's venous plexus." This is more developed in Carnivora than in Herbivora and has been mistaken for Schlemm's canal, which is an entirely different structure. To avoid confusion, it is better to call it the "intrascleral venous plexus." There is not, properly speaking, a Schlemm's canal in lower Mammalia, but only venous branches at different levels in the sinus and at different distances from the inner scleral surface. The ciliary body has also numerous vessels very near the sinus to promote the absorption of the aqueous.

In Primates the disposition of the angle is quite different (figs. 22 to 25). Instead of having two portions, detached and attached, the ciliary body has grown with the enormous development of the ciliary muscle into a large triangular structure, which is inserted by a strong tendon into the scleral spur. A new structure appears in Primates, Schlemm's canal. While in Ungulata and Carnivora there is only a more or

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Fig. 13 (Troncoso and Castroviejo). Dissection of a sheep's eye. O, end of the suprachoroidal space; U, end of the lateral attachment of the muscle to the scleral wall. The other letters signify the same as in figure 12.

Fig. 17 (Troncoso and Castroviejo). Section of a dog's eye in the horizontal meridian. Light-coated animal. The bundle of longitudinal fibers of the tendon, N, lining the outer wall of the sinus, S, is very clearly seen. O, end of suprachoroidal space; U, end of longitudinal fibers. Note the difference in the shape of the corneal slant at the junction in comparison with figure 16.

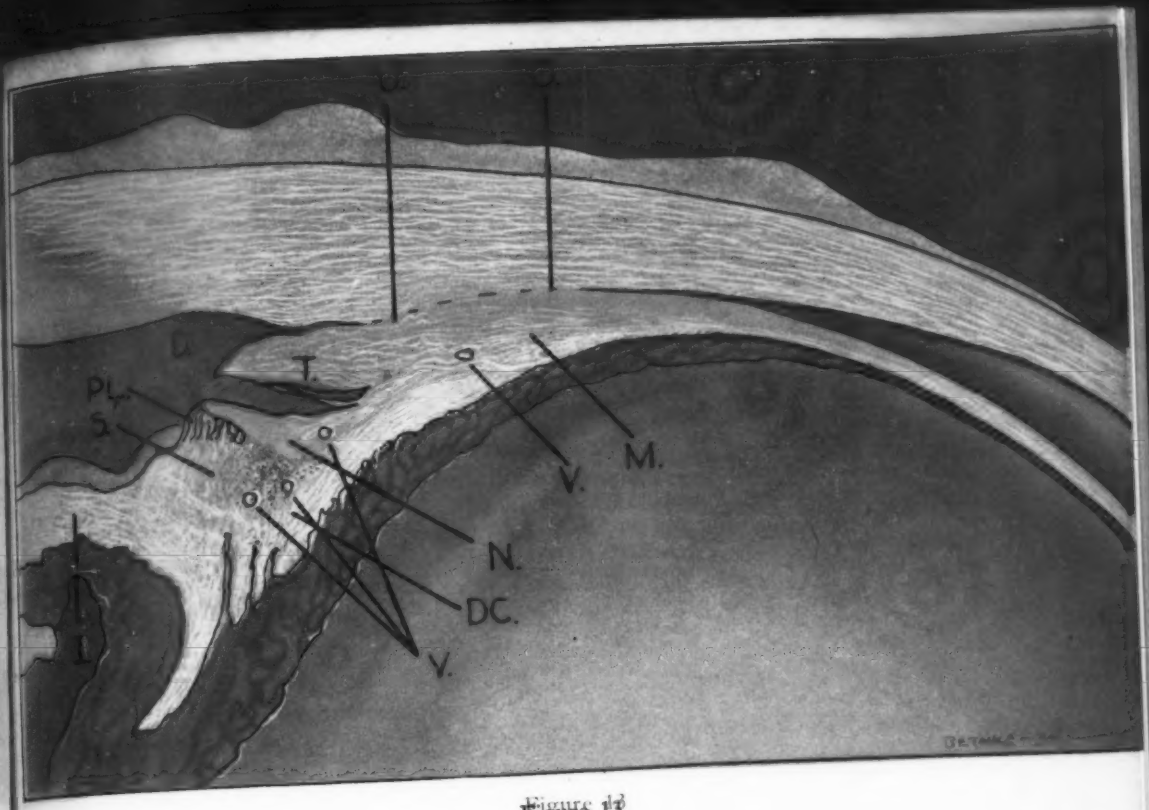

Figure 13

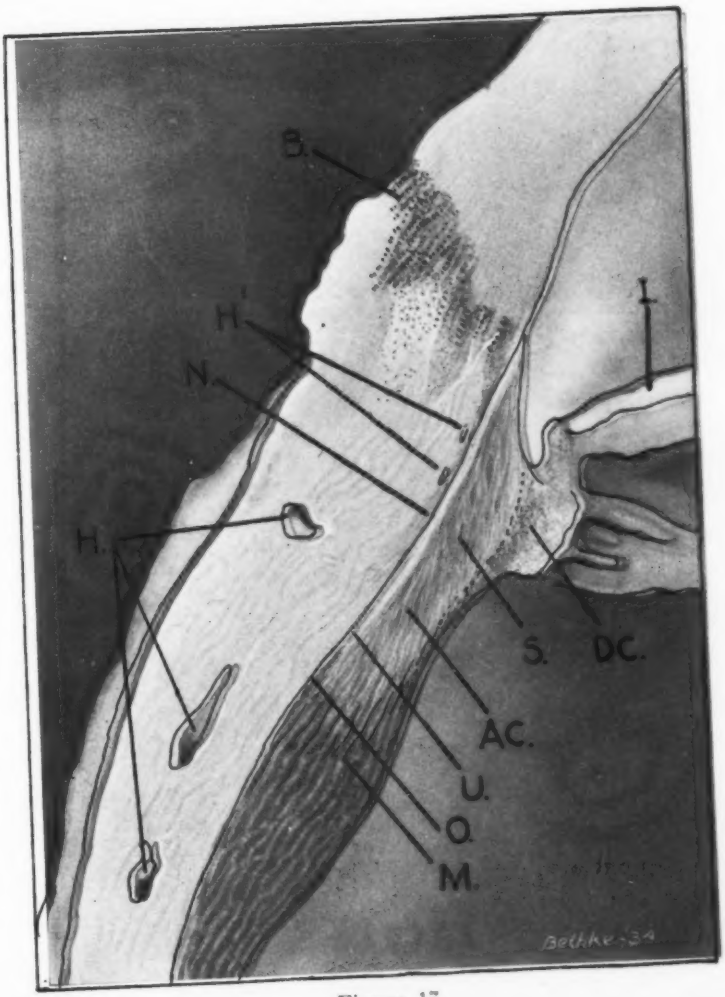

Figure 17

Fig. 18 (Troncoso and Castroviejo). Dissection of the same eye as in figure 17. Horizontal meridian. N, bundle of tendon fibers; S, cavity of the sinus; U, upper attachment of the muscle, M, to sclera.

Fig. 21 (Troncoso and Castroviejo). Dissection of a cat's eye. The sinus is gaping and the fibers of the pectinate, P, torn from the sclera, are lying above the detached ciliary body, DC. The longitudinal bundle N, N', has also been torn and separated from the sclera. Some of its fibers still cling to both scleral and ciliary walls. U, base of tendon; O, suprachoroidal space.

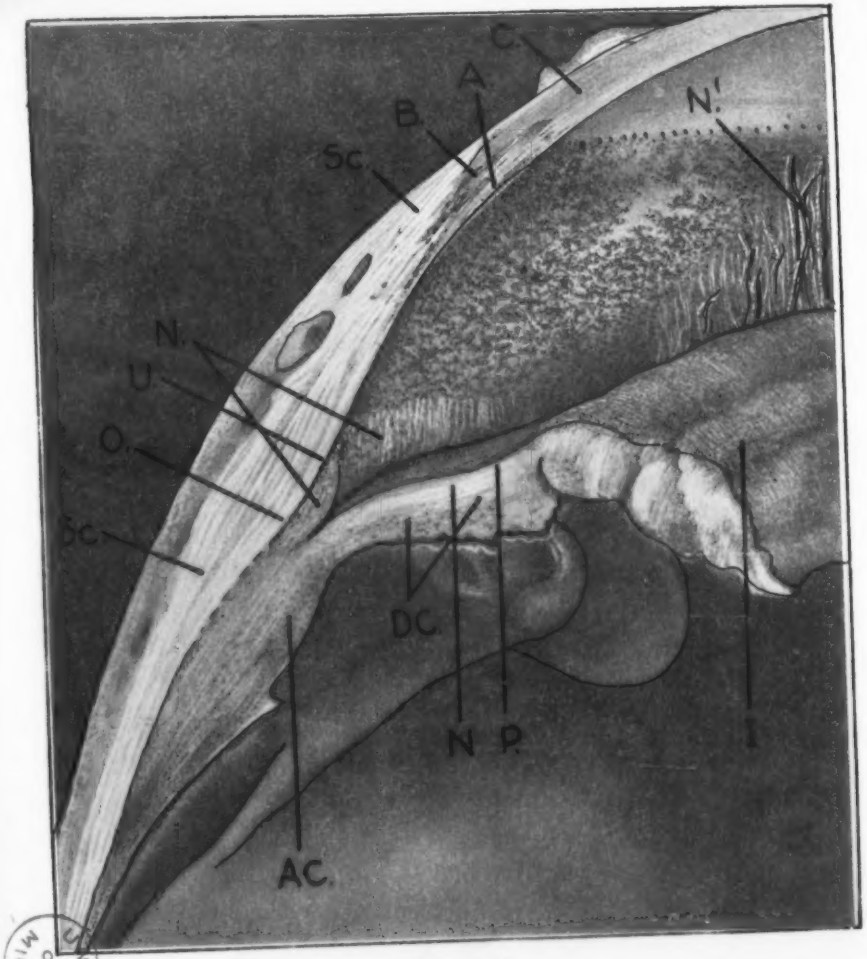

Figure 21
Figure 21

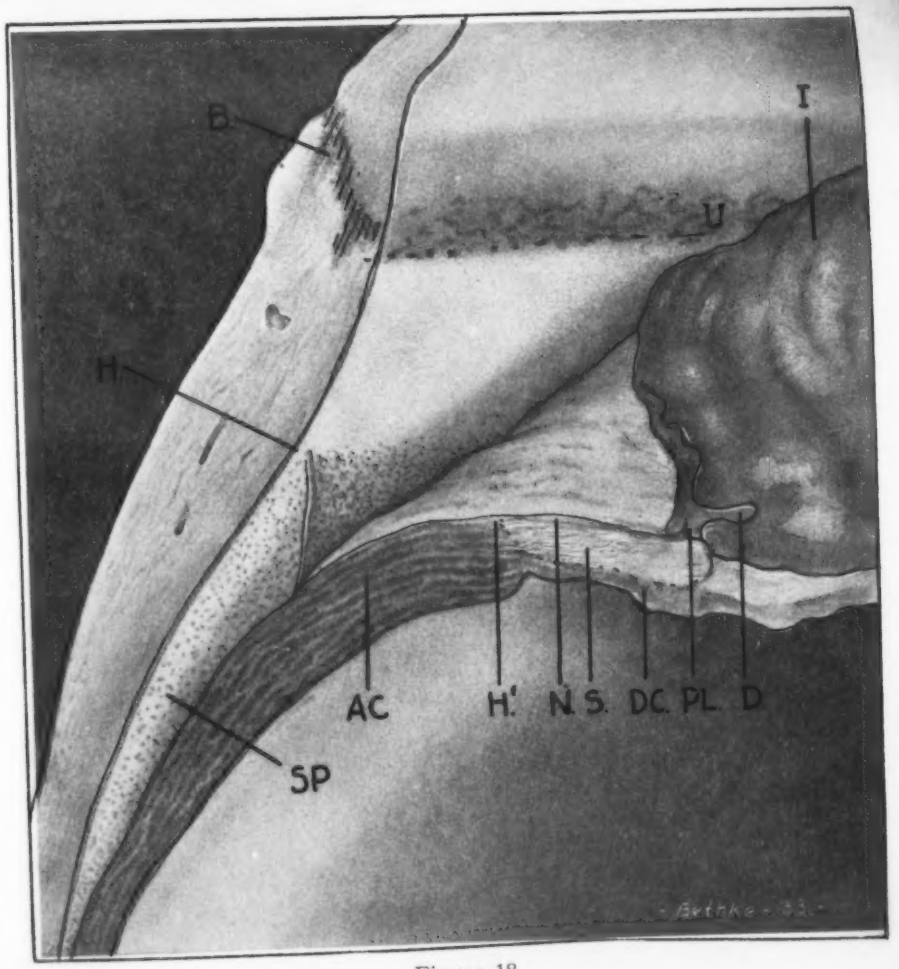

Figure 18
Figure 18

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Fig. 27 (Troncoso and Castroviejo). Meridional section of a human eye. The lens is missing and the iris has been drawn down by a hook. I, iris; PL, pectinate ligament; IR, iris root; CB, ciliary body; CS, Schlemm's canal; T, trabeculum covering the sulcus; Sc, sclera; AB, bulgings of the cornea inside, separated by a sulcus; C, external swelling of the cornea.

Fig. 29 (Troncoso and Castroviejo). Meridional section of a human eye showing the sclero-corneal junction and the position of Schlemm's canal at the tip of the corneal slant. The letters have the same significance as in figure 28. CB′, faint ciliary-body band, above which a narrow pigmented line can be seen. The blue coloration of the cornea extends farther back than it should.

Fig. 31 (Troncoso and Castroviejo). Dissection of a human eye. Brown iris. Marked pigmentation of the anterior concave surface of the ciliary body, CB, at the place of the ciliary-body band. A, pigmented band covering Schlemm's zone. The dissecting needle has detached the tendon of the muscle from its scleral insertion below the canal, CS, carrying with it the sulcus trabeculum, T, and stopping at the upper limit of the canal. The blue coloration of the cornea extends farther back than it should.

Fig. 32 (Troncoso and Castroviejo). Dissection of the same eye as in figure 30. The ciliary body, CB, has been entirely torn away from its scleral insertion and is separated from the scleral wall by a cotton ball, X; O, sharp edge of the ciliary body containing the tendon, which slopes down at the inner side, in a concave surface forming the sinus, CB, before joining the iris root. PL, fibers of the pectinate still attached to the sclera at the bottom of the separated structures; A, wire which after probing Schlemm's canal, CS, has torn away the sulcus trabeculum, T, through which its tip can still be seen by transparency. Dots of pigment are deposited in the meshwork above T, forming a continuous line at the level of the canal.

Fig. 30 (Troncoso and Castroviejo). The same eye as in figure 29 after the iris has been torn from the ciliary body. The anterior surface of the ciliary body CB′ is slightly pigmented, the iris being blue. The pigmented band, A, corresponds to Schlemm's zone, above the canal, CS. Pr, ciliary processes which show above a denser, brown pigmentation where the iris root was torn. The suprachoroidal space, O, is very lightly pigmented. The blue coloration of the cornea extends farther back than it should.

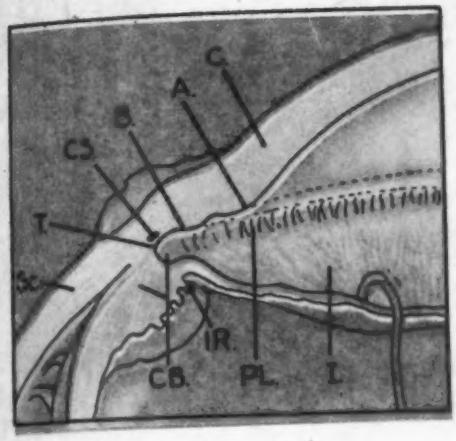

Figure 27

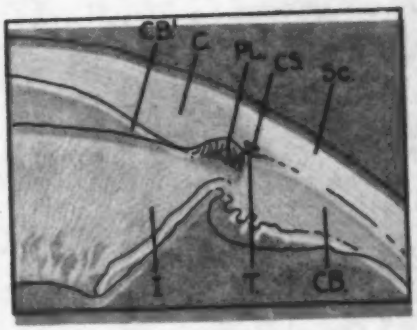

Figure 29

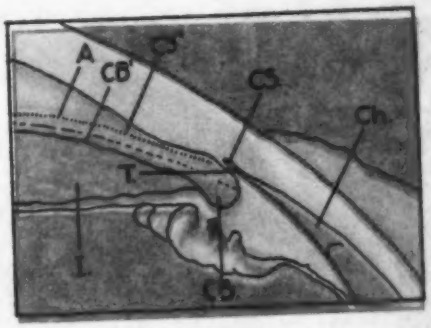

Figure 31

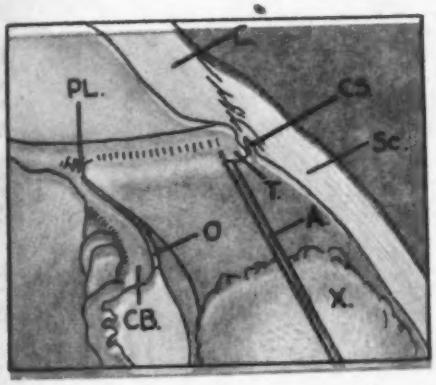

Figure 32

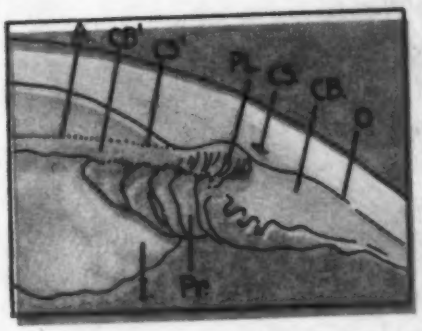

Figure 30

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Figure 33A (Sheep)

Figure 33B (Cat)

Figure 33C (Chimpanzee)

Figure 33D (Man)

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less compact venous plexus inside of the sclera, in monkeys there is a groove carved at the inner surface of the cornea and the scleral slant, just above the insertion of the ciliary body. This is an anatomical landmark and can be found in any section, while the so-called Schlemm's canal in lower Mammalia is one or two intrascleral veins near the surface of the sclera and always varies as to its site. In M. rhesus and the chimpanzee, the root of the iris is still suspended by the fibers of the pectinate ligament, and there is still a small sinus between the root of the iris and the sclera.

In man the iris root is strongly attached to the anterior border of the ciliary body and there is no longer any need of a suspensory ligament, but the fibers of the pectinate are still visible in a rudimentary condition, especially in frontal views of the angle with the slitlamp (figs. 27 to 30, PL). Outside the fibers of the pectinate ligament, also called the "uveal trabeculum," there is in man as in the monkey, a new tissue, a meshwork of fibers that closes the open side of the sclero-corneal groove and forms the inner side of Schlemm's canal, the sclero-corneal trabeculum. In the so-called "meshwork tissue of the angle" are thus embodied two different structures. With the slitlamp it is easy to see at the edge of the section, first the thick meshwork of strands closing the inner side of the canal (the sclero-corneal, which may be better called the sulcus trabeculum), and second, especially in a frontal view, the fibers of the pectinate which start from the iris root, curve around the small depression or sinus and then ascending in a straight course fuse with the end of Descemet's membrane and the corneal stroma (the so-called uveal trabeculum). Dissecting this region, tearing the root of the iris first and then the ciliary body from its attachment to the spur (fig. 31), the two kinds of structures covering Schlemm's groove are very easily detected, and their nature and arrangement better understood.

The radiating fibers of the ciliary muscle are strongly inserted into the scleral spur by a direct tendon, which forms the fixed point for the contraction of these fibers when they draw forward the choroid and posterior part of the orbiculus ciliaris. The pectinate ligament (so-called uveal trabeculum) is most probably in man a check ligament which keeps the radiated and especially the annular or sphincterlike fibers in position when the ciliary processes advance toward the sagittal axis of the eye during accommodation.

From the standpoint of the evolution of the eye it is important to determine if the sclero-corneal sinus of lower Mammalia has closed in man by adhesion of the two walls or, on the contrary, if the sinus has been widely opened and its apex become the angle proper. To decide this, two landmarks should be considered: the end of Descemet's membrane and the upper end of the suprachoroidal space. By direct measurements with a micrometer on the eyes of the four orders, the writers conclude that while in Ungulata the iris is about at the level of the end of Descemet's membrane, in Carnivora the iris has receded; but in Primates the insertion of the ciliary body has moved forward to the scleral spur, which results in a closing of the cilio-scleral sinus. This is due to the enormous development of the ciliary muscle in monkeys and man.

(Part II will appear in the next issue.)

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Fig. 33 (Troncoso and Castroviejo). Comparison of the four types of the pectinate ligament and of the structures of the angle of the anterior chamber in Mammalia. A, Herbivora or Ungulata (sheep); B, Carnivora (cat); C, Primates (chimpanzee); and D, man.

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CONCERNING ACCOMMODATIVE ASTHENOPIA FOLLOWING HEAD INJURY

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The annoyance and fatigue which many patients experience in reading following head injury, are not due in most instances to a loss of accommodation. The presence of skull fracture in head injury is not so important as actual injury of brain tissue. Seventy-two patients who had sustained head injury were examined and of this number 65 percent had an accommodative power within normal limits for their ages as defined by Duane. Five had been examined previously, of whom two had a subnormal accommodation before injury and three had a normal accommodation before and after injury. The conclusion is drawn from a study of these 72 cases that loss of accommodation following head injury has nothing to do with the discomfort in reading so often complained of but rather that there has been some disturbance in the organization of the function of reading.

The annoyance and fatigue which many patients experience in reading, following injuries of the head, are not due, in most instances, to a loss of accommodative power. In every case of head injury with or without skull fracture the possibility of involvement of the ocular mechanism and adnexia is very great. Six cranial nerves (II, III, IV, V, VI, and VII) and their nuclei, terminals, and cortical associations together with their spinal and cervical-sympathetic connections are exposed to damage by hemorrhage and exudate from the contusion and from pinching in the lips of the fracture itself.[1]

Great importance has always been attached to the presence or absence of a skull fracture in severe head injury. In reality, fracture is secondary in importance to the nature and extent of the injury to the brain itself. Serious and fatal cases of head injury may occur in which numerous hemorrhages in the deeper structures of the brain are found only when skull fracture is not present. Extensive fracture of the skull may be present in cases in which there are no sequelae of brain trauma.[2] Leary,[3] from his extensive observations, concludes that while severe trauma to the head may cause subdural hemorrhages producing disabilities, psychoses, and death, on the other hand very slight injuries, not associated with skull fracture and without definite history of head injury, may be followed by similar intracranial hemorrhages with attendant disabilities. As pointed out by Mock[4] there is a class of cases in which the injury had not been considered serious and in which the symptoms had cleared up quickly and the patient been sent back to work shortly without signs of trauma. Later many of these patients complained of headache, vertigo, and fatigue upon exertion of any kind, especially that requiring concentration as in reading. Morax[5] has presented a series of cases of head injury in which some of the symptoms appeared long after the accident. In conjunction with permanent symptoms, such as partial or total homonymous hemianopsia, there were periodic scotomata and other transitory visual disturbances followed by convulsive attacks, in some instances. The late results of trauma may be due to the effect of injury of the cerebral vessels which later rupture, causing hemiplegia, hemianopsia, or hemianesthesia, even in patients free from hypertension or other vascular disease, or to the rupture of congenital or acquired aneurysmal defects in the walls of the smaller cerebral vessels.[6] Bollinger[7] has described a clinical entity which he designated "traumatic late-apoplexy" following trauma and making its appearance days or weeks after the accident.

A very large percentage of individuals who have sustained head injuries of any importance complain of visual disturbances. These are manifested in many ways and have been tabulated by Smith,[2] as follows: 1. Impairment of central vision. 2. Defects in peripheral fields of vision. 3. Impairment or loss of function of the cortical centers or association fibers, causing conceptual blind-

ness (mind blindness or object blindness) in which the patient can see objects, but fails to recognize them for what they are. 4. Loss of ability to recognize colors. 5. Motor derangements, including ptosis, paralysis of the extrinsic muscles, interference with the normal pupillary reactions, loss of accommodative power, impairment of conjugate ocular movements, etc. 6. Nystagmus. 7. Purely psychic affections of the sight, such as occur in hysteria, traumatic neurasthenia, etc.

There is no general agreement among observers as to the cranial nerve most frequently involved in head injury, but, as is the case with other symptoms, those due to gross cranial-nerve involvement tend to disappear in about 18 months and those which do not in that time are probably permanent. In my own experience, the second and sixth are most frequently affected. Kearny found the third most frequently involved, Pannus the sixth, and Heine the seventh. Pfingst[8] reports a case in which the fourth was impaired. White[9] in a personal communication reports one case of paresis of the right superior rectus and a paralysis of the right inferior rectus in a child seen some months following a fall after which she had been unconscious for some time. Few cases of ophthalmoplegia following head injury have been reported.[10] Friedenwald[11] reports six cases, one following a severe blow on the head. Scarlet[12] noted pupillary changes and ophthalmoplegia as the result of war injuries. Roy[13] was able to find in the literature only 25 cases of complete, unilateral, traumatic ophthalmoplegia, mostly reported by French observers, with optic atrophy the almost universal sequela. Gunn[14] believes that the third nerve is rarely involved in its periphery. Lillie and Adson[35] report two cases of unilateral, central, and annular scotoma produced by callus in a fracture along the base of the skull which involved the optic canal. A roentgenogram did not show the fracture, examination while in the hospital revealed nothing abnormal in the eyes, and the change in visual acuity in each case was not evident until two months after the accident.

One of the posttraumatic sequelae of which many patients complain following head injury is the inability to read for any length of time, even when a proper correction for the ametropia and presbyopia is worn. As many of these patients suffer from inability to concentrate and complain of fatigue on exertion of any kind, accommodative asthenopia is a well-considered part of the general picture. Visual functional power depends upon psychological, physiological, and mechanical factors.[16] Visual efficiency may be impaired by total or even partial maladjustment of any of these factors by physiological or pathological change. As so well described by Adler[17] in his recent contribution to a more concise understanding of ocular physiology, the ability to read with comfort is not only a matter of visual acuity, but concerns many functions. Among these is the power of attention, which represents the willingness and ability to make a conscious effort to read and the ability both physically and mentally to direct and fix the eyes so that an image of each letter falls upon the macula of each eye and properly to interpret such stimulus when transmitted to the brain. The ability to fixate each letter and separate it visually from other letters is accomplished by ocular-muscle coördination and mental response. Lancaster and Williams[18] pointed out that the ciliary muscle which controls accommodation is a smooth, unstriped involuntary muscle with all the characteristics of such tissue elsewhere in the body, the most important of which is tone and contracture. Its action is under the influence of the third cranial nerve through the ciliary nerves which reach it from the suprachoroidal space, in which location they are in intimate association with the sympathetic nerves.

While the inability to read for any length of time or with any degree of comfort is frequently noted by many observers and cases of subnormal accommodation have been attributed to head injury, no mention is found in the available literature at hand of any detailed study of the accommodation in a large number of cases of head injury. Prangen[19] quotes Duane as placing the

incidence of subnormal accommodation at 5 percent of all cases of refraction and Theobald at 10 percent. Allen[20] reviewed a large series of cases and concluded that anomalies of accommodation occur in 2 percent of the patients in a general ophthalmic practice. Prangen[19] reports 20 cases of subnormal accommodation and attributes the difficulty to focal infection, not mentioning head injury as a contributing factor. His cases were in patients below the normal presbyopic age and he attributed the difficulty as afflicting asthenic persons who are deficient in their reserve of nervous energy and subject to infections, principally focal in nature. In the 200 cases which Duane[21] studied, he found but one case in which he thought the etiological factor was a head injury—namely a concussion, the result of an accident in a football game. In one of the two cases reported by Lillie and Adson,[15] the accommodation was definitely subnormal. Scarlet[12] mentions head injury as the cause of loss of accommodation, but reports no such cases in detail. Friendenwald[11] reported six cases of ophthalmoplegia exterior, one following a severe blow on the head in which he found "good accommodation."

Duane[21] in writing about subnormal accommodation states that there is no sharp dividing line between paralysis and insufficiency of accommodation either as regards objective evidences, subjective symptoms, or causation. A paralysis may be present in which the patient cannot use his eyes at all for near work, or an insufficiency in which he can use them only with difficulty. Accommodative insufficiency may be said to exist when the manifest accommodation is at or below the minimum for the age of the patient, as expressed in the table of accommodation at various ages compiled after much painstaking investigation by Duane.[22] The accommodation may be subnormal, even if it is above the minimum, provided it is below that found at a previous examination, or if at subsequent examinations a greater amount is found.

In classifying accommodative insufficiency Duane[21] defines static insufficiency as being due to undue inertia or lack of response of the lens or ciliary muscle, although the energy actuating the ciliary muscle is normal. In this type, the accommodation shows no variation from time to time, but steadily declines and is below normal at each examination. Such patients have few subjective symptoms and obtain relief by the correction of their ametropia and their premature presbyopia.

In the second type of insufficiency, namely, dynamic, the fault lies not in the response of the ciliary muscle and lens, but in the centers and nerves governing ciliary action. In such patients, the accommodation varies greatly if tested frequently and they read with difficulty and with much discomfort, even when the ametropia and presbyopia are apparently adequately corrected. In such cases, pupillary involvement may or may not be present. Subnormal accommodation with pupillary involvement is due to lesions of the peripheral nervous mechanism or of the lower centers governing accommodation—namely, the nerve terminals, ciliary and oculomotor nerves, and third-nerve nuclei—according to Duane,[21] while the same author states that subnormal accommodation without involvement of the pupil is due to lesions of the higher centers—the internuclear and supranuclear connections.

Duane[22] determined the power of accommodation in patients by first testing their refraction carefully and with this correction, plus whatever determinate addition was necessary to bring the range within measurable limits, located the point on a modified Prince's rule at which his fine-line test object blurred.[23] Of such determinations he[22] has said, "When investigating the accommodative power of a given patient, we do not so much care to know whether it is close to the value assumed as the average for his age, but whether it lies within the normal limits." Duane[21] called attention to the fact that the muscle balance in subnormal accommodation has always been considered to be an esophoria for near: this being evidence of a convergence excess produced by excessive effort to overcome the low accommodative power. In his series of cases, 76 percent

showed, however, a convergence insufficiency. Theobald,[24] on the other hand, held that subnormal accommodation obtained if the amount of esophoria was the same or more at 13 inches than at 20 feet, or if the exophoria was the same or less at 13 inches than at 20 feet. Theobald also stated that patients suffering from insufficiency of the ciliary muscles or subnormal accommodative power . . . hold the printed page unusually close to the eyes, because the weak ciliary muscles when supported by a strong convergent effort are better able to perform their task than they are when, with the type held farther off, the tension upon the internal recti is much lessened. Eames[25] is convinced that a poor fusion convergence is a factor in reading disabilities.

Haessler[26] concluded from his study of accommodation and divergence at various distances that the impulse to accommodate influences the balance between the mechanisms of divergence and convergence in such a way as to increase the divergence of the visual axes. His observations contradict the belief that the impulse to accommodate is always associated with increased convergence.

Duane[21] noted, as associated symptoms in many cases of subnormal accommodation, a marked congestion of the conjunctival vessels, and in a still larger proportion of the cases, an engorgement of the larger vessels of the disc or capillary injection of the disc, often a transient contraction of the fields coexisting as a further proof of nervous exhaustion, variability of the insufficiency of accommodation as one of the most characteristic phenomena of the condition and, after an apparent cure, recurrences of the trouble.

Studies of accommodation in present series

Case histories of my 72 patients who had sustained severe head injury were reviewed to note the accommodation that had been recorded at the postcycloplegic test following the head injury. In this series the patients had recovered sufficiently to be ambulatory, having sustained head injury from two weeks to 48 years before the particular ocular examination upon which this report is based had been made.

There were 47 males and 25 females ranging in age at the time of examination from 5½ to 75 years. Skull fracture had been determined in 25 cases. In none had ophthalmoplegia, complete or incomplete, internal or external, been noted at any time, yet all complained of some visual difficulty, especially in reading. The accommodation was tested on a modified Prince's rule[22] and comparison made with that in Duane's[22] table for the age of the patient.

Forty-seven patients had an accommodative power within or above normal limits for their ages as defined by Duane.[22] Of this group, 30 patients sustained contusion without skull fracture, 21 of whom were unconscious following the injury. Seventeen sustained skull fracture, 10 of whom were unconscious following the injury. From this series of 72 cases, the conclusion might be drawn that loss of accommodative power following severe head injury is not the only factor in prompting the complaint of these patients that they are unable to read with comfort, as 65 percent had an accommodative power within the normal limits for their ages as defined by Duane.[22]

Cases previously examined. Of the 72 cases here tabulated, five had been examined before the injury occurred. In one, E. M. M., examined two years before injury (concussion) the accommodation was two diopters below the minimum for her age.[22] However, this patient had had poor vision in one eye associated with monocular internal strabismus. Following the injury, the accommodation was three diopters below the minimum for her age.

In the second case, W. H., examined two years before injury (skull fracture) the accommodation was two diopters below the minimum for his age.[22] The patient had normal vision in both eyes, although there was evidence of previous keratitis. Following injury the accommodation was three diopters below the minimum for his age.

In the third case, L. B. H. (concus-

Table 1

ACCOMMODATION FOLLOWING CONTUSION OR FRACTURE OF THE SKULL

Accommodation		*Contusion*	*Fracture*
Below normal limits	25	17	8
Conscious	7	5	2
Unconscious	18	12	6
Within or above normal limits	47	30	17
Conscious	16	9	7
Unconscious	31	21	10
Conscious	23	14	9
Unconscious	49	33	16
	72	47	25

sion), the accommodation had been above normal three years before the accident and remained so after the accident.

In the fourth case, I. L. (concussion), examined 17 months before the accident, the accommodation was within normal limits and remained so after the accident.

In the fifth case, B. R. (concussion), examined five years before the accident, the accommodation was within normal limits and remained so after the accident.

In the first two cases previously examined, in which the accommodation was known, there was a drop, but in the last three (concussion) the accommodation was within normal limits both before and after the accident.

Unequal accommodation. Ten patients not included in this series of 72 cases, showed unequal accommodation in the two eyes following severe head injury. Unequal accommodation is a common condition, being observed frequently, not necessarily following head injury, as recorded by several writers, and requires adequate treatment for the relief of symptoms,[21, 22, 27] of eyestrain. Grimm[28] denies the influence of unequal accommodation as a factor in discomfort in reading, being himself able to overcome a difference of 1.5 D. in the two eyes, and believes the distinctness of the images to be the result of fusion and not of antagonism. In this group of 10 patients (20 eyes) examined as to an inequality of ocular activity, tabulation demonstrated that when the accommodation was found to be unequal following head injury, that of the greater was within normal limits in nine cases, and below in two, and that of the lesser was within normal in two cases and below in seven.

Table 2

UNEQUAL ACCOMMODATION FOLLOWING HEAD INJURY

			Contusion	Fracture
Greater right eye / Lesser left eye	five cases	Below normal		1
		Within normal	1	4
		Below normal		2
		Within normal	1	1
			2	8
Conscious 2				
Unconscious 3				
Lesser right eye / Greater left eye	five cases	Below normal	2	2
		Within normal	1	
		Below normal		1
		Within normal	3	1
			6	4
Conscious 5				
Unconscious 0				

Conclusions

In none of these 72 cases was there any difficulty in recognizing words be-

cause of injury to particular cortical areas.[29] Marion Monroe,[30] in her excellent text, "Children who cannot read," calls attention to the fact that such a complex mechanism as the visual apparatus constitutes a function that is perfect in its adjustment only when the entire organization of the function is perfect. The distinction between the function itself and the organization of that function is perhaps important in understanding the various complaints of those who have sustained head injury. The more complex the function, such as reading, the more is the organization of the function disturbed by cortical injury, and the greater the complexity, the slower is the recovery from cortical trauma.

The actual ability to read is seldom lost following severe head injury, as evidenced by the fact that in this series of cases 65 percent had an accommodative power within the normal limits, but the organization of the function is probably impaired so that the complaint of annoyance and fatigue in reading expressed by patients following head injury cannot be explained by poor vision, accommodative insufficiency, or muscle imbalance, but is the result of impairment of the organization of the function of reading.

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TREATMENT OF THE FLAT TYPE OF SEPARATED RETINA AND OF MACULAR HOLE WITH SPECIAL DEVICES AND MODIFICATIONS

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LOS ANGELES

Adhering, because of satisfactory results, to the principle previously described in this Journal, that is, of using noninsulated iridium-platinum micropins, the problem of the diathermic treatment of flat or shallow retinal separations without damage to the retina was studied.

It was found that the extremely small size of the protuberance or stop that may be formed on the micropin shaft to limit penetration without insulation, made possible the formation of detachable multiple micropins in many forms and lengths. Short-stop multiple micropins can be selected which will penetrate just to the choroid and yet when released by the forceps will remain firmly anchored in the sclera, preventing possible loss of fluid until removed. Curved micropins and other devices for more delicate treatment of shallow detachments are also described. Read before the American Ophthalmological Society at Hot Springs, Va., June 5, 6, 7, 1935.

In diathermic treatment of separated retina it is most desirable not to injure the retina itself, even in flat detachments, because of the likelihood of leaving a new hole. In a previous paper[1] the use of very slanting punctures made with a "beading needle" and reaching for a distance of 2 to 3 mm. between sclera and choroid was described. Later,[2] the possibility was emphasized, of slanting certain of my single iridium-platinum micropins, since they had no shoulders to interfere with slanting, as was the case with the usual insulated pins. In this communication other devices for treating over flat detachments, namely, the curved single pin and the short-stop pin, both single and multiple, will be described.

Micropin stop. In experimenting with a great variety of uninsulated iridium-platinum micropins it was necessary to determine first the smallest size of stop that could limit penetration to any depth, especially just to the choroid, and still control leakage. A small amount of continued leakage softens the eye rapidly and shortens the distance between retina and choroid, so that, when another pin barely penetrates the choroid of the softening eye, it may dimple the sclera sufficiently, under the pressure necessarily used, to produce a hole in the retina, even though it be just barely touched. (To aid in the closure of any such undesired retinal holes, either seen or suspected, I have found it advisable to switch from diathermy to negative galvanic current and to treat all of the micropins with 1 M.A. of current for 1 second just before they are removed and while they are still sticking in barrage-line position on the sclera.)

The first stops were tiny rings, soldered with platinum to the pin at the point desired. This device was illustrated as the ring-stop pin, in figure 8 of the previous[2] communication. It may have a thread eyelet above the forceps hold, as described previously, or it may have the thread eyelet also used as a forceps hold, placed immediately above the stop (figs. 6, 7, 8, and all others with eyelet tops). When the pin is firmly seated, the thread may be removed at once, if the operator maintains a careful count at all times.

The ring stop, however, possessed an advantage over the coil pin[1] only in that it left less bulk above the sclera to interfere with rotation of the eye, or to provide leverage leading to dislodgment or to partial loosening of the pin, allowing a slight leakage along the shaft. On the other hand it obscured the view of the degree of coagulation that had taken place, also the ring interfered and was not satisfactory when it was used slantingly. Therefore, much finer wire was used for the ring, but this ring shifted during soldering so that the length below the stop was variable and difficult to control, making the pin more expensive. Segments of ring gave still more trouble, but indicated that a still smaller stop could be used successfully. However, it was

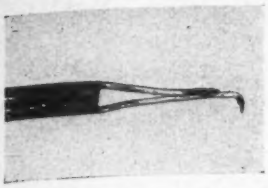

Fig. 1 (Walker). Monodent short-stop.

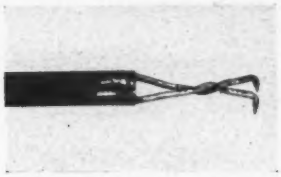

Fig. 2 (Walker). Bident short-stop.

Fig. 3 (Walker). Curved single coil. May be applied with either stylus or forceps.

Fig. 4 (Walker). Curved single-spur stop.

Fig. 5 (Walker). Slanting, flat rotating (long or short) end stop. Forceps only.

Fig. 6 (Walker). Ring or ring-segment stop. Forceps only.

Fig. 7 (Walker). Plain end-stop twisted. Forceps only.

Fig. 8 (Walker). Spur-stop. Forceps only.

Fig. 9 (Walker). Plain end-stop. Forceps only.

Fig. 10 (Walker). Flattened end-stop. Forceps only.

Fig. 11 (Walker). Step-stop, double point. Forceps only.

Fig. 12 (Walker). Step-stop, double-point coil. Stylus or forceps.

deemed advantageous to have a stop that would also prevent the forceps from slipping down on the shaft under pressure.

This led to formation of the spur-stop (fig. 8) and the end twist-stop (fig. 7). These pins were entirely satisfactory, except that they stood a little higher above the sclera than the plain endstop (fig. 9), and could be slanted in one certain direction (stop upward) to much greater advantage than in other directions. This was not true of the plain end-stop pin, nor was there any tendency for the forceps to slip downward to any appreciable extent, and this slight possibility was entirely eliminated by flattening the end-stop into a fishtail form (fig. 10), which made quite the most satisfactory type of single straight micropin to be used with the forceps.

This flattened end-stop pin (fig. 10) meets every requirement of a single straight pin: (1) It is short above the sclera (1 mm. or less); (2) it has an ample stop for both, pin and forceps; (3) it can be used with or without a thread; (4) it can be slanted in either direction; (5) it gives a complete view of the coagulation and, (6) it may be curved to the right or to the left to make another most valuable form (fig. 4).

Curved micropin. This curved end-stop micropin has advantages which justify its frequent use, especially in flat detachments, toward the edge of bullous detachments, or when the eye is quite soft, so that straight pressure tends to push the sclera and choroid toward the retina by pressing the subretinal fluid away in all directions. The curved pin is especially valuable if one has no galvanic current easily available with which to treat possible retinal holes, as previously mentioned, before removing the pin. It has all the advantages of the single straight pin, sticking even more firmly, without displaying a tendency to dislodgment by rotary manipulation of the eyeball because it lies closer to the sclera. The motion used in scleral placement is that of sewing with a very short curved needle the point of which presses downward only at the start, but as the sclera is penetrated the pressure becomes lateral and finally slightly lifting. With a shallow bite just to the choroid, some features of the slanting puncture may be obtained without drainage on removal of the pin. Quite often holes made in the retina by short straight pins are in such good juxtaposition to the corresponding choroidal inflammation that they become sealed and a cure results, but I have known this to be a slow, annoying process which at times justified the worry, the result being a redetachment and the necessity for another operation. Still another more rapid method of obtaining choroidal treatment without danger to the retina will be described under the heading of multiple short-stop pins.

Step-stops. Although such stops as have been described, especially the flattened end-stops, were satisfactory for single straight or curved pins, a somewhat smaller stop was found to be necessary and practical for multiple or gang pins. Such a stop, called a "step-stop," was found to be formed best on the pin shaft itself, by grinding the pin down to the desired size from material having a diameter too large by .004 inch, thereby leaving a shoulder or abrupt step at the point where penetration must stop.

This step-stop was first applied to nondetachable electrodes in the form of a right-angled hook (figs. 1 and 2), in the hope of perfecting a method of stippling the sclera rapidly down to the choroid without inducing leakage. To obtain rigidity, the platinum wire was braced or twisted and was made long enough so that the tips could be cleaned frequently by heating to redness in the alcohol flame. When it is necessary to resharpen these tips, they are grasped in a fine forceps just above the level of the stop, which is thus protected, while the knife-edged hone, or jeweler's file, is used on the exposed part to be sharpened. Rapid work, especially on flat detachments or on the area within the barrage line, may be satisfactorily done with the bident (fig. 2), but even with a stop at three-eights or four-tenths millimeter from the point, one

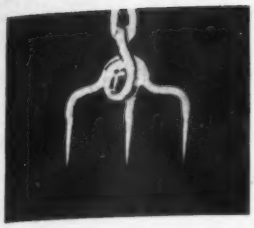

Fig. 13 (Walker). Step-stop, three-point-in-line coil. Stylus or forceps.

Fig. 14 (Walker). Step-stop, three-point-in-line eyelet. Forceps only.

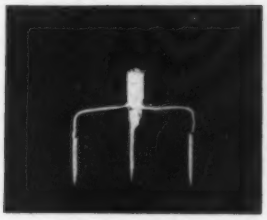

Fig. 15 (Walker). Step-stop, three-point-in-line cylinder. Forceps only.

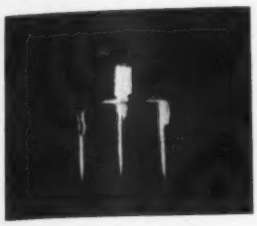

Fig. 16 (Walker). Step-stop, three-point-in-triangle cylinder. Forceps only.

Fig. 17 (Walker). Step-stop, three-point-in-triangle ring eyelet. Forceps only.

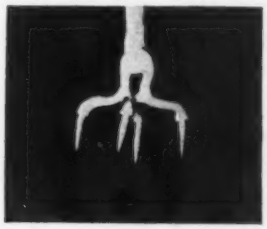

Fig. 18 (Walker). Step-stop, four-point-in-diamond-formation ring eyelet.

Fig. 19 (Walker). Finger-ring magazine (stainless steel or German silver, Monel metal) for single forceps pins without thread only.

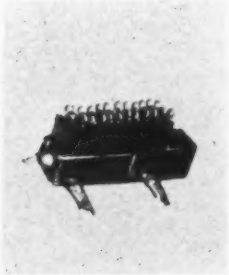

Fig. 20 (Walker). Finger-ring magazine, lid removed to show metal combination holding 24 single forceps pins.

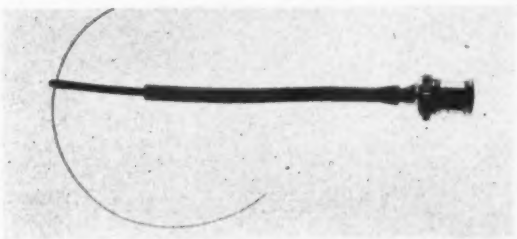

Fig. 21 (Walker). Needle and rubber connection for macular undermining treatment with 3 percent KOH injection under ophthalmoscopic control.

cannot be sure that occasional leakage will not occur on thin scleral spots, so that the instrument had to be reserved for the last stages of the operation, when leakage could be tolerated better. If, for some reason, one were limited to just one diathermic electrode, one would perhaps be forced to choose an instrument of the bident short-stop type. By the use of heavier material to withstand greater pressure, three or four more prongs or pins could be added, but no great advantage would be gained because the action of a single bident is sufficiently rapid.

Multiple short-stop detachable micropins. It is known that when three or more pins are placed in a row, the end pins receive the most diathermic current; therefore when using three prongs, they should be placed at the corners of a two-millimeter equilateral triangle or the corresponding diamond shape should be used for four-prong pins. Aided by the described step-stops so placed on each prong that they not only limit the penetration but also keep the crossbars from touching the sclera, it is possible to use satisfactorily uninsulated iridium-platinum pins combined into gangs or brushes yet detachable *in situ* so as to prevent leakage. Such pins can be handled either with stylus or with forceps, and with or without thread.

Figure 12 shows the two-prong and figure 13 the three-prong step-stop micropins which can be used with either a stylus or the forceps, whereas figures 11 and 14 show the same models for use with forceps only, permitting of somewhat less height above the sclera because of the absence of the coil. Threads are used to hold the multiple pins in folded gauze, booked in fiberboard, but after the pins are set in the sclera, it is optional whether or not the threads be left attached. The risk of losing these bulkier pins is so slight that threads are usually removed at the time of fixation in the sclera.

Figures 15 and 16 show three pins in a row and three in a triangle, with a tiny cylinder in place of the eyelet, so that the pin can be held in any axis of rotation that will best fit the barrage line, otherwise the rotation must be accomplished with the forceps handle. However, the useful eyelet is sacrificed. It must be noted that the eyelet is useful not only for holding the pins with forceps or with thread, and with platinum wire to flaming, but it can also serve in stringing them for sterilizing by boiling, after which the sterile nurse may mount them by sticking them, just before the operation, in a wet boiled double-layered muslin tambour that has been prepared by ruling it in tiny squares, one for each pin. The muslin may also be cross-hatched with lines of machine sewing and thus more permanently marked. With this method one must take care that no pin has been knocked out of its square before being taken to place in the sclera.

On account of the curvature of the eyeball and the pressure required for placement, I have not found it profitable to make more than four pins in gang. The diamond shape (fig. 18), with all pins equidistant at 2 mm., is the best arrangement for uniform treatment. To maintain this spacing in the barrage line, three-prong pins in triangular arrangement (fig. 17), are occasionally used as accessories and even one- and two-prong pins are employed at the end of the barrage line.

When the four-prong diamond-shaped pin is made with the length of point below the stop only three-eighths of a millimeter, it becomes an important and frequently used accessory. Having a wide base, it can, even with such short points, be left sticking *in situ* quite firmly, and thus prevent, as a rule, the small amount of leakage occasionally found when the bident is used. One-, two-, or even three-prong micropins, when in detachable short-stop form with points 0.375 mm. to 0.5 mm. long, will treat the choroid satisfactorily, but may be tilted out of the sclera too easily. With four-prong pins, much greater stability is obtained, so that the entire double-barrage line, and often the entire enclosed area, may be treated without the loss of any fluid. However, toward the end of the opera-

tion, if drainage pins have already been set, any of the multiple short-stop detachable pins may be held in the forceps and used repeatedly in the same manner as the bident. The four-prong short-stop micropin especially thus becomes a most useful instrument for the general treatment of flat detachments because of the possibility of reducing loss of fluid and consequent softening of the eyeball, and at the same time permitting rapid work.

Counting or numbered magazines. If one is willing to risk the use of single micropins without threads attached, certain advantages may be gained by mounting them in nonrusting metal magazines, such as are shown in figures 19 and 20. As platinum is too expensive, stainless steel, Monel metal, or German silver may be used. No matter what form of sterilization is used (dry heat for one hour at 250° F. is best), the points are both well protected and thoroughly exposed to the heat without the possibility of contamination by foreign substance during sterilization. Figure 20 shows the metal-comb type, made to hold two dozen pins in so small a space that during the operation it can be worn on the index finger with great convenience and at the same time permitting the use of the hand. The cover is quickly snapped on during any long intervals when the pins are not being placed. Any single pins except the coil pins may be stored in this device, and often can be placed in the sclera faster than it can be prepared for treatment by the average assistants. To avoid dulling these pins when placing them in the magazine, the shank of the pin is advanced into the comb at the square edge of the teeth, and the point is made to trail or follow into final position. The count on placement and on removal is kept by checking the number of pins remaining in the comb.

A more direct counting magazine was also designed in disc form (fig. 22), resembling in a general way the ordinary ophthalmoscope head with only one moving part. This moving part, the rotating cover, is provided with an opening that can be closed and that can easily be made to expose the consecutively numbered pins one at a time. To do this, the magazine is held in the palm like a stop-watch, while the thumb of the same hand presses the protruding lever of the rotating cover. A bracket for a tape is available to prevent the possibility of the magazine's accidentally slipping to the floor. The pins are placed in their numbered receptacles with a lateral motion, so that the point follows without being dulled in magazining. In removing the pins, however, the motion of the forceps is straight outward to the rim of the magazine. These magazines, holding 24 to 36 pins, speed up the work to be done with them to a marked degree.

Treatment of macular hole

In addition to the problem of flat detachment, the treatment of a hole or tear in or close to the macula requires special attention. I have been most successful in employing the Lindner undermining method* and a three-percent solution of KOH either by injection with a syringe or by NaOH as produced with negative electrolysis on the undermining spatula, or my special electrode after it is in position behind

* Originally Lindner's undermining procedure was accomplished by cutting with a sharp discission needle and under binocular magnification, a 2- or 3-mm. linear scleral incision down to the choroid, on the temporal side of the eye, from 20 to 26 mm. behind the limbus, according to the refraction, so that a distance of only 10 or 12 mm. of undermining with a calibrated spatula between sclera and choroid would be necessary to reach the suprachoroidal space immediately behind the macula. Under ophthalmoscopic observation, the movements of the undermining spatula or of the special injection needle could be observed as a control of accuracy, while 0.02 c.c. of KOH, varying from 2 to 4 percent in strength was injected. A 0.25 c.c. syringe was used, fitted with a special, curved, stiff alloy needle, flattened and closed at the tip like a spatula. A single opening was filed in the side of this needle 2 mm. from the tip. Any peripheral retinal holes were then treated as usual by the operator's method of choice. (cf. Lindner, K. Weitere Erfahrungen mit der Unterminierungsmethode bei Netzhautabhebungen mit Netzhautlöchern am hinteren Augenpol. Klin. Monatsbl. f. Augenh., 1933, v. 90, June, p. 757).

the choroid at the macula. In four cases out of six the treatment has resulted in very satisfactory "cures," with good fields and ability to read ordinary typewritten print. However, I have had sufficient trouble with ophthalmoscopic control and in one instance with bleeding, so that I have designed a better needle arrangement to take care of both of these conditions during the injection of the KOH, and also to take advantage of certain landmarks I have sought for, in order to get better control of direction toward the macula.

The needle (fig. 23), has a 2.5 cm. length of rather stiff thread rubber tubing interposed between the needle tip and the syringe fitting, so that when the needle is in position subsclerally toward the macula, the barrel of the syringe may be lowered out of the way of the ophthalmoscope in a line running somewhat horizontally across the upper margin of the cornea. This at once permits the direction or meridian of the macula to be established, both for the undermining spatula and injection needle. I have observed on the eyeball and on models that when the sclera is trephined immediately above the center of the inferior oblique attachment, (1) the macula, (2) the trephine center, (3) the upper end of the external rectus stump, and (4) the upper margin of the clear cornea establish a sufficiently accurate meridian along which the needle and tubing may be directed to the macula. The needle and tubing are

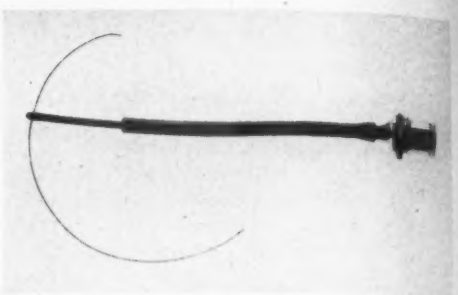

Fig. 23 (Walker). Short double-outlet spatula needle with flexible rubber-tubing connection for treatment of macular region with 3-percent KOH injection after retrochoroidal undermining (Lindner).

easily held in good approximate alignment by forceps at the needle end and by the syringe barrel at the other end of the tubing. When close to the macula the needle tip may be given motions to be identified ophthalmoscopically by moving the syringe barrel or by gentle pressure of the fixation forceps on the needle or the tubing, 5 or 10 mm. from the trephine opening. Instead of a single sawtooth opening in the side of the needle, well behind the tip, which can act like a hook, as in the Lindner model, and scratch the choroid, producing hemorrhage or premature loss of fluid, my needle has a through and through double opening as close as possible to the tip, which allows a more uniform distribution of alkali and is much more readily cleaned. Behind these openings the needle is lightly marked at 9, 10, and 11 mm., and the rubber tubing, also serving as a depth gauge, is usually set at 12 mm., although, if necessary for a long eyeball, it can be set back several millimeters more. In such a case (over 10 D. of myopia) the upper edge of the dilated pupil instead of the upper edge of the cornea is used for the alignment. This needle and this procedure have given most satisfactory results, since it seems practically always possible and with only one tenotomy, preferably of the superior or inferior rectus, to attach

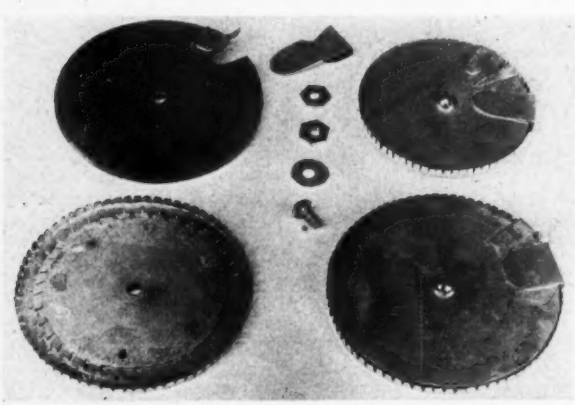

Fig. 22 (Walker). Disc magazine all metal for 36 forceps pins.

the macula through this quite advantageously situated trephine area just above the inferior-oblique attachment. I have also obtained drainage through this same trephine opening by simply sparking the choroid with diathermic current without penetration of the micropin, provided transillumination through the pupil or direct observation showed a space free of choroidal vessels. It is usually easy to find such a space in this region. Care must be used only to touch the choroid, because if the needle is permitted to penetrate, the unsupported choroid sticks easily to the needle by coagulation, and as the needle is removed, it may produce hemorrhage. If there is a peripheral-tear area also to be treated, drainage at the trephine opening is not necessary.

Conclusions

1. In order not to injure the retina when diathermy is being used, curved 1⅞ mm. single micropins are the best type for barraging over flat retinal detachments. These pins stick much more firmly in the sclera, can be used without threads, and lie so flat to the sclera as to permit of free rotation of the eyeball.

2. The detachable four-prong short-stop pin, in diamond-pattern arrangement and penetrating only to the choroid, is the most useful multiple pin when sizable areas have to be rapidly treated with minimal leakage.

3. Treatment of all pins while still in the sclera with 1 second of a 1-M.A. negative galvanic current offers a further excellent aid to closure of the unexpected retinal holes that are frequently seen on careful inspection after micropuncture, especially in regions of shallow detachment, even when every precaution has been taken to forestall them.

4. The injection of 1/50 c.c. of 3¼ percent alkali with a special syringe and needle after a subscleral undermining to the back of the macular choroid has been made, has given excellent treatment of macular hole. Alkali may also be produced galvanically in the same undermined region under easier opthalmoscopic control and with very similar results.

5. Recent observations lead to the conclusion that macular weak spots and small holes, which may easily be overlooked without a very sharply focused strong light in the ophthalmoscope, have been present together with instances of larger holes in over 10 percent of the cases observed.

6. Metal magazines have been successfully made and satisfactorily used, to hold single straight micropins without threads for more rapid application with forceps during the operation, while at the same time an accurate count is maintained. These pins may be slanted in any direction in case of shallow detachment.

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SETON OPERATION IN GLAUCOMA

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In a high percentage of cases the common operative procedures for glaucoma fail to control permanently the intraocular tension. In order to avoid repeated operations, the authors propose the use of a seton operation, so that the simple subconjunctival manipulation of the seton may be substituted for additional operative procedures when secondary rises of tension occur. A preliminary report on the use of the technique in glaucoma with aphakia was presented before the Sixth Congress of the Pan-American Medical Association, in June, 1935.

Glaucoma still presents many perplexing problems to practicing ophthalmic surgeons. For instance, many see patients with aphakia and glaucoma, or with absolute glaucoma, frequently enough to be almost continually embarrassed by the lack of a good method for controlling the intraocular hypertension. After repeatedly getting poor results with the standard surgical procedures, a modified seton operation was employed by the authors with such favorable results in a succession of cases that a much broader use of the operation is planned for the future.

Undoubtedly, it is because of the paucity of knowledge concerning the etiology and pathology of glaucoma that little practical or factual progress has been made in its surgical treatment in the past 30 years. In writing on recent views as to the mechanism of glaucoma, in 1929, Kronfeld[1] stated: "After about twenty-five years of intensive work on the problems of glaucoma, we have come to the conclusion that the idea of Theodor Leber is still a good working hypothesis. . . . We have not been able to make any important contribution to the old idea."

Due to this lack of evidence concerning the etiology, and to the absence of a common basis upon which the principles of the various glaucoma operations stand, there is no general agreement as to the relative efficacy and value of each type of operation. Moreover, since all direct attempts to discover the cause or causes of glaucoma have thus far been futile, it is not entirely improbable that one might inadvertently strike upon the mystery of its etiology by first solving the problem of its therapeutic control.

It is neither necessary nor advisable that surgeons continually limit their possibilities for conserving vision and stifle initiative and individual ingenuity by attempting to maintain an artificial sanctity of custom and tradition and by punctiliously conforming to past theories (which are still theories and not scientific facts); but rather they should foster the germination of new ideas and the reception of new influences that may prove to be of great import. The effects of histaminelike products liberated in the tissue and the influence of axon reflexes on the uveal tract, as pointed out by Duke Elder[2]; the influence of the endocrines as studied and reported by Imre,[3] Marx,[4] Bothman,[5] and Dubois[6]; the existence of local vascular stasis as proved by Redslob,[7] and the effects of sympathetic instability, noted by Parsons,[8] are all examples of the various fields into which the study of glaucoma is leading.

No one can sincerely belittle the efforts that have already contributed so much to our present degree of understanding. Perhaps better coöperation and coördination between research and clinical study might bring about even more substantial results.

Let us consider briefly certain aspects of modern glaucoma surgery. The danger of late infection, with involvement of the uveal tract, is frequently pointed to as a major objection to the various types of subconjunctival fistulizing operations now widely utilized in the treatment of glaucoma. It appears, however, that this danger is greatly overestimated. In the study of the incidence of late infection Eerola[9] found that, in 5,616 cases in which the Elliot trephine operation was employed, late postoperative infection occurred in only

1.8 percent; and in 954 cases in which the Holth iridencleisis operation was employed, late postoperative infection occurred in only about 0.4 percent. These percentages are not of such serious proportions as to constitute real objections to fistulizing operations, especially when one compares these percentages with those from other types of surgery. It is not improbable that the incidence of postoperative infection could easily be reduced simply by a wider use of the Green[10] automatic trephine, which greatly reduces trauma and thus tends to maintain normal tissue resistance.

If, however, the real objective of operations of this type were always attained, i.e., the permanent control of hypertension, our problem would be a much more simple one. It is common knowledge that such is not the case. In a recent report by Knapp[11] statistics showed that in 95 patients operated upon by the Lagrange method a return of hypertension occurred in 10.5 percent; and in 80 patients operated upon by the trephine method a return of hypertension occurred in 25 percent. Here, then, is the real objection to antiglaucoma operations now in common use. The patient is requested to submit to an operation already involving a high percentage of statistical failures that leave with the surgeon a painful feeling of inadequacy. One cannot feel satisfied with the present status of surgery in glaucoma.

Moreover, cases of glaucoma are often seen in which special and complicating conditions render the application of the popular fistulizing operations impractical and often impossible. These include certain cases of aphakia with glaucoma in which a large iridectomy has been performed above, of absolute glaucoma with stony-hard, painful eyeballs, and of glaucomatous eyes which have previously been subjected to one or more surgical procedures. In such cases the performance of an external fistulizing operation (trephining, sclerectomy, iridencleisis) is often mechanically impossible, and an internal fistulizing operation (cyclodialysis, intraocular iridencleisis of Mauksch,[12] sclero-ciliary iridencleisis of Del Barrio[13]) is decidedly impractical. Wolfe[14] has previously described an iridencleisis operation for glaucoma with aphakia, but it is not mechanically applicable in cases in which there is a large iris coloboma, or in which few or no capsular remnants are present. The latter condition occurs when glaucoma persists or intervenes following an intracapsular cataract extraction. Such cases are rare but recently two have been observed here.

Repeatedly confronted with this problem in which none of the glaucoma operations available proved adequate, it was decided to resort to a procedure that has long since been described but never used extensively nor yet applied in the light of certain newer concepts of the surgical control of glaucoma.

In 1912, Zorab[15] described an operation that he had devised for the relief of increased intraocular tension, and subsequently reported the results obtained in 21 eyes operated upon by his method. Briefly, Zorab described his operation, which he called aqueoplasty, as follows: "The anterior chamber is drained into the subconjunctival space by means of a silk thread. The site chosen is the upper part of the globe. A large conjunctival flap is first raised. An incision with a keratome is then made through the sclerotic into the anterior chamber. A bend of silk is passed into the chamber, so that the loop lies anterior to the iris, the distal ends of the silk lying outside the globe, on the exposed sclerotic. The flap of conjunctiva is then replaced and stitched (over the distal ends of the silk)."

The same operative procedure was described concurrently by Mayou[16] who was not impressed by any advantages it had over the trephine operation.[17]

In 1915, Wood[18, 19] described a modification which he called the sclero-corneal seton: With a perforated Graefe knife, a narrow incision was made in the sclera at the superior corneal margin. When the puncture and counterpuncture had been made, a double-armed braided silk suture was inserted into the hole in the Graefe knife which was then withdrawn so that the suture

was pulled into the wound and through the anterior chamber. The ends of the suture were then buried under the conjunctiva by means of the needles.

Vail,[20] in 1915 described a technique in which he passed a threaded needle through the coats of the eye in the region of the ora serrata, brought it out about 8 mm. away, and buried the thread under the conjunctiva, there to remain for a three-months' period.

In 1916, Wheelock[21] described a further modification of Zorab's and Wood's techniques, involving an incision at the corneo-scleral margin under

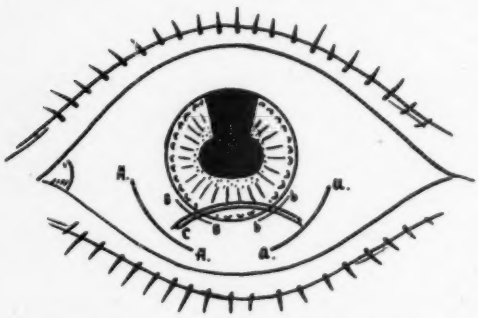

Fig. 1 (Wolfe and Blaess). The seton operation as performed by the authors. A-A and a-a, conjunctival incisions; B-B and b-b, scleral incisions; C, seton in position under cornea and conjunctiva.

a conjunctival flap, and the passing of a needle and suture directly through the cornea.

In 1934, Row[22] inserted a loop of horse hair through a scleral incision and forward in the suprachoroidal space into the anterior chamber. The free ends of the loop were buried under Tenon's capsule.

In almost every instance the authors reported good results with these various operations and yet none of them has come into wide or general use.

The motivating factors which led us to employ this modification of seton drainage were not only those of a negative character, such as the shortcomings of the commonly used glaucoma operations, nor simply those of a more positive character, such as the good results obtained from previous attempts at seton drainage, but, much more important, an original and distinctive mental concept of a method of controlled drainage. As previously shown by statistics (see the foregoing), the chief objection to glaucoma operations, in general, is the fact that only too often the effects of the operation are not permanent: tension again rises, the visual fields continue to shrink, and another operation becomes inevitable. To avoid this sequence of events and to provide assurance of permanent control of tension and symptoms, the seton in this operation is inserted in such a manner that it may subsequently be manipulated with a forceps through the conjunctiva, eliminating all necessity of further operative procedures for glaucoma. For example, if the drainage established by the insertion of the seton becomes inadequate and the tension begins to rise, all that is necessary is to instill a few drops of two-percent butyn, seize the ends of the seton with forceps through the conjunctiva, and draw them alternately from side to side. This immediately reopens the filtration channels, greatly facilitates the drainage, and reduces the tension without requiring again the opening or incising of the eye. It has the same effect as if a paracentesis were performed under the conjunctiva and it may be repeated as often as conditions indicate its necessity. It spares the patient the great expense, inconvenience, and mental anguish associated with repeated surgery. And, to be pragmatic, it works.

This operative procedure as developed and now carried out differs considerably from any previously published description of a seton operation. Yet it is simple and easily performed. No extra equipment, no special instruments are necessary. Its outstanding features are its simplicity, ease of performance, and absence of operative complications.

Technique

Five-percent cocaine is used for anesthesia. A retrobulbar injection of procaine-epinephrine solution is also carried out. An 8 mm. curved conjunctival incision is then made down and nasally about 5 mm. from the cornea and concentric with the limbus (fig. 1).

The conjunctiva is undermined from this incision to the cornea and the pocket flap is turned back over the cornea. A similar flap is made down and temporally from the cornea. Then a keratome is thrust into the anterior chamber under the nasal conjunctival flap until a 3-mm. incision has been made in the sclera just beyond the limbus; after which the conjunctival flap is replaced over the limbal incision. If all the aqueous has escaped, one may wait 5 or 10 minutes for the anterior chamber to re-form, or physiological saline solution may be injected with a syringe under the flap to restore the anterior chamber immediately. A similar incision is then made with the keratome under the temporal flap. Both conjunctival flaps are now turned back over the cornea. A straight, blunt-tipped lacrimal needle that has been threaded with braided white silk is inserted into the anterior chamber through the keratome incision, from the temporal side and is carefully worked through between the cornea and the iris until the tip with the protruding thread emerges from the incision on the nasal side. An assistant draws back the nasal conjunctival flap, grasps the silk suture with forceps, and pulls it through as the lacrimal needle is carefully withdrawn. Each end of the seton is simply cut off about 4 or 5 mm. from the limbus and buried under the pocket flap. Each conjunctival incision is then closed with a continuous black silk suture; tying is unnecessary. Ointment is instilled and both eyes are bandaged. This is usually all that is required. On the fifth or sixth day, the conjunctival sutures can be removed. Often a small conjunctival bleb, indicating active filtration, will appear at the limbus, where the suture emerges from the anterior chamber and passes under the conjunctiva.

Comparison of this simplified technique with that described previously for seton operations will at once disclose the advantages of the new method. The original operation of Zorab and Mayou was not designed to permit manipulation of the seton. It therefore is open to the same objections as are other subconjunctival-filtration operations in which there is a high percentage of return of increased tension.

Wood's operation requires special instruments, is more difficult to perform, and does not allow a ready manipulation of the seton. Moreover, in drawing a double suture through the anterior chamber without the precise control and protection afforded by the lacrimal needle, which serves as a metallic sheath, the danger of iris prolapse is greatly increased. None of these objections is encountered in the operation as described by the authors above.

Report of Cases

Case 1. Mrs. S. G., aged 72 years, was first seen on December 22, 1932, with incipient nucleo-cortical cataracts, chronic noninflammatory glaucoma, and corneal leucoma (lime burn 30 years previously) in both eyes. The fundi were somewhat obscured by corneal and lenticular opacities but the discs looked pale with no definite cupping. Corrected vision on the right was 10/200, and on the left 15/100. Tension was 26 (Schiötz) in each eye but the patient had already been receiving treatment with miotics. On December 23d, a right Barraquer lens extraction was performed, followed by a stormy postoperative course due to intervening bronchitis.

On May 16, 1933, the corrected vision of the right eye was 18/200. On May 17, 1933, the left lens was removed in its capsule. On June 8th, the corrected vision of the left eye was 18/200 plus 1.

On December 15, 1933, the patient returned and corrected vision was 18/200 in the right eye and 18/70 in the left. Central fields revealed a relative central scotoma, contraction peripherally, and marked enlargement of the blind spot. The tension was 26 mm. Hg in the right eye and 35 in the left eye (Schiötz). Under miotics and dehydration therapy the tension was lowered temporarily but could not be controlled and repeatedly rose to 35. On December 28, 1933, an iris-inclusion operation was performed on the left eye. This failed to control the tension and on January 13, 1934, the left tension was again 35 mm. Hg. Miotics failed to keep the tension down. On February 7, 1934, a seton operation was performed on the left eye. The reaction subsided slowly and on February 14th, the seton was loosened under the conjunctiva to facilitate drainage. On February 15th, the tension was 27 mm. Hg. On February 19th, the seton was again manipulated and combined with massage. The eye gradually healed under this treatment, and on March 3, 1934, the tension was 17.

On October 22, 1935, 20 months after its insertion, the seton was still in place, the eye is quiet; the conjunctiva and sclera were

normally pale, the tension was normal and the corrected vision remained at 18/70.

Case 2. Mrs. L. P. aged 73 years, appeared on January 5, 1935, complaining of loss of vision. For the past year she had consulted a physician in a neighboring city who had prescribed drops (miotics) for her eyes twice a day; but her continued loss of vision had made her apprehensive. She complained of some pain in the right eye and had seen colored halos with the left eye for the past 6 months.

In the right eye the vision was nil. The cornea was clear; there was a mixed ciliary injection. On the atrophied iris was a new blood-vessel formation. There was an almost complete posterior annular synechia. In the lens irregular opacities were scattered in the cortex. The vitreous was fluid and some floaters were discernible. Examination of the fundus revealed a total cupping of the disc. The right tension was 68 mm. Hg (Gradle-Schiötz).

In the left eye the vision was 20/200. There was an incipient nucleo-cortical cataract which prevented a good view of the fundus. The left tension was 38 mm. Hg. The nasal and upper temporal fields were markedly contracted.

A 48-hour tension study was carried out and both eyes prepared for operation.

On January 7, 1935, an Elliot trephining was performed on the left eye. The condition of the left eye has been entirely satisfactory since the operation.

On January 23, 1935, a Holth sclerectomy and iridencleisis were performed on the right eye. In two weeks the patient was discharged from the hospital but returned May 14, 1935, with a tension of 60 mm. Hg. (Gradle-Schiötz) in the right eye and recurrence of symptoms.

On May 15, 1935, a seton operation was performed on the right eye. In five days the conjunctival sutures were removed. The eye cleared slowly but the tension has remained down ever since the operation.

In November, 1935, the right eye was still normally soft and free from symptoms.

Case 3. Mr. J. B., aged 70 years, was first examined on May 10, 1935. He complained of loss of vision in the right eye for the past 18 years, occasional attacks of ocular pain in the right eye, and gradual loss of visual acuity in the left eye for the past six years. The left eye had been operated on for glaucoma 10 years ago and again three years prior to examination.

The right eye had attained absolute glaucoma. There was a complete posterior annular synechia and an entirely opaque lens. The right tension was 35 mm. Hg (Gradle-Schiötz).

Visual acuity in the left eye was reduced to finger counting at three feet and could not be improved by refraction. Light projected from the temporal side was not perceived. The cornea was clear, the anterior chamber shallow, and the lens almost entirely opaque and intumescent. There was a large irregular 2.5-mm. opening in the sclera at the limbus above, through which the adjacent iris and ciliary body had prolapsed. The whole iris was displaced upward by this prolapse and in the "6-o'clock" position below was separated from the ciliary body, producing a partial iridodialysis. The uveal prolapse pushed up under the conjunctiva above, elevating it at that point. The left tension was 28 mm. Hg (Gradle-Schiötz).

On May 14, 1935, a seton was inserted into the right eye. The conjunctival incisions healed rapidly.

On May 18, 1935, a Barraquer intracapsular lens extraction was performed on the left eye. The eye healed slowly because of the large scleral defect, but a month later the corrected vision of this eye was 20/50 minus 2. The left disc remained cupped but the increased tension did not recur.

On June 28th, the seton was by accident partially withdrawn so that only one end from under the temporal conjunctiva extended into the anterior chamber. The right eye has remained soft and comfortable and the conjunctiva cleared except for a slight redness over the end of the seton.

Case 4. Mrs. G. K., aged 76 years, appeared on April 12, 1935, with absolute glaucoma in both eyes, and complaining bitterly of the severe pain. Before the onset of her ocular trouble, three months previously, she had enjoyed good vision in each eye.

Examination revealed no vision, no light perception, and no pupillary reactions. Both eyes were red and stony hard, the corneae fairly clear, and the anterior chambers shallow. There was necrosis of the free margins of the irides with posterior synechiae; the pupils were wide, irregularly oval, and fixed. Nucleo-cortical cataracts were present in each lens. There was a fair red reflex from each fundus but no detail could be made out. The tension was 79 and 74 mm. Hg (Gradle-Schiötz) in the right and left eye, respectively.

On April 15, 1935, the seton operation was performed on each eye. The pain was relieved soon after the retrobulbar injection and did not recur thereafter. There was a small operative hemorrhage into the anterior chamber of the left eye. Resorption was slow. On the eighth day, postoperative, the conjunctival sutures were removed. The right eye cleared steadily and the left eye more slowly due to a spastic entropion which aggravated the existing inflammation. Both eyes remained soft and when the patient was last heard from, November 12, 1935, the eyes were comfortable and symptom-free.

Case 5. Mr. A. B., aged 78 years, appeared on May 2, 1935, complaining of ocular pain and failing vision. Vision in the left eye was

reduced to light perception with faulty projection; in the right eye it was 20/40. Each lens showed moderate nuclear sclerosis and slight clouding of the cortex. Examination of the fundi revealed a subtotal cupping of each disc. The tension in the right eye was 32 and in the left eye 52 mm. Hg (Gradle-Schiötz). The patient's physician reported a four-plus Wassermann reaction.

On May 7, 1935, the seton operation was performed on the left eye. The right eye was treated with miotics and the patient placed on a course of antiluetic treatment. The left eye healed slowly but eventually became normally pale.

On August 12, 1935, the patient reappeared, complaining of pain and redness in the left eye. The tension in this eye was 55; in the right, 26. The left conjunctiva was then anesthetized. Each end of the seton was seized with a forceps through the conjunctiva and drawn slightly from side to side. A small bleb occurred in the conjunctiva at the point where the seton emerged from the anterior chamber. The eye again cleared and the tension remained within the normal range. When last seen in November, 1935, the left eye was quiet, the conjunctiva pale, and the tension normal.

Case 6. Mrs. W. B., aged 61 years, appeared on October 10, 1935, complaining of a blind, painful right eye. She had been advised to have the eye removed and was willing to submit to enucleation. Vision in this eye was nil. The lids were edematous, the eye beefy red. The limbal vessels were dilated and extended into the cornea from below; the cornea was cloudy and in places the epithelium had exfoliated leaving a raw surface which stained deeply with fluorescein. The anterior chamber was very shallow, the iris discolored, the pupil fixed, and the lens opaque and intumescent. The tactile tension was definitely elevated. Transillumination was negative.

The corrected vision of the left eye was 20/20 minus 2. The media were clear. The tension in this eye was 36 mm. Hg (McLean). There was a marked vascular congestion in the fundus and a mild papillary edema. The central field chart revealed a definite enlargement of the blind spot and a well-defined Seidel's scotoma.

The patient was hospitalized and treated with pilocarpine, eserine, epinephrine, and dehydration without any improvement. On October 14, 1935, a seton operation was performed on the right eye. A slight hemorrhage from the iris into the anterior chamber occurred on the second day, but cleared rapidly. Following the seton operation there was a remarkable improvement in the right eye. The conjunctival inflammation and chemosis subsided rapidly, the cornea cleared and became entirely epithelialized, and the dilated blood vessels extending in at the limbus receded. This enabled us to examine the lens in much greater detail. It was huge and intumescent, pushing the iris forward and blocking drainage at the angles. It was entirely opaque, and the posterior cortex and capsule were not visible with the slitlamp. It was then decided to remove the lens. This was attempted on October 25, 1935. Because of the swollen lens and shallow anterior chamber only a small corneal section was possible with the cataract knife. As the incision was enlarged with the scissors the lens delivered spontaneously and was followed by an expulsive choroidal hemorrhage. Two days later the eye was enucleated.

So striking and apparent was the improvement in the latter case following the seton operation that everyone who saw it was greatly impressed by its efficacy in restoring the drainage and circulation of the intraocular fluids.

In addition to those just cited, the seton operation has been employed in five additional recent cases, with excellent results, thus far, in every case.

It has been particularly in absolute glaucoma that we have been so greatly impressed with the value of the seton operation. Time after time, we see an eye that is irrevocably blind, useless, and even painful; and yet there is an innate reluctance on the part of the patient to have such an eye removed. In these, the seton permanently controls the tension by restoring drainage and, at the same time, relieves the symptoms and maintains the integrity of the structures of the anterior ocular segment. The patient is thus enabled to retain his own eyes and avoid the annoying inconveniences of wearing protheses. Of far more importance, however, it averts the depressing psychic shock and desperate feeling of hopelessness which so often overcome patients who are advised to have their eyes enucleated.

In conclusion, we wish to emphasize that this modification of the seton operation was devised to reduce intraocular tension and, more specifically, to make available a simple and easy method of controlling any secondary rise in tension that might occur without having to resort to further operative procedures. We believe that it will serve as a useful and valuable adjunct to the surgical armamentarium of the modern ophthalmologist.

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THE TOLERANCE OF LIGHT IN NONPHOTOPHOBIC INDIVIDUALS

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Results are given concerning the tolerance for light, as determined by glarometric methods readily adapted to clinical investigations, of 144 persons who did not complain of ocular discomfort nor sensitiveness to light under ordinary conditions. Frequency distributions of glare-out measurements are given for binocular and monocular observations of the target under a specified intensity of illumination. Data are presented concerning the effects produced on glare-out values by the use of various absorptive filters, changes in intensity of the illumination at the fixation target, and changes in the spectral character of the glare field. From the Division of Physics and Biophysical Research of the Mayo Foundation. Abridgment of thesis submitted by Dr. E. C. Albers to the Faculty of the Graduate School of the University of Minnesota in partial fulfillment of the requirements for the degree of Master of Science in Ophthalmology. Work done in the Division of Physics and Biophysical Research.

Glare may be defined as a brightness within the field of view of such intensity as to cause ocular discomfort or interference with visual functions Three classifications of glare are commonly made: (1) veiling glare, the result of light uniformly superimposed on the retinal image which reduces contrast and, therefore, visibility; (2) dazzling glare, caused by adventitious light scattered in the ocular media so as to form part of the retinal image; and (3) blinding or scotomatic glare, which is produced by light of sufficient intensity to reduce the sensitivity of the retina. The definition, as well as the classifications of glare, is essentially a description of situations in which reduction of visibility or uncomfortable vision occurs, rather than precise statements of the nature of the phenomena. This is attributable to the fact that the effects of glare are stated chiefly in terms of sensation produced and are, therefore, subjective in character, vary with and are also variable in the individual, and are difficult to measure. As a result, the effects produced by glare are definite in character, but a quantitative measurement of them involves the inherent difficulties common to most measurements of human behavior and response.

The determination of glare

It is not within the purview of this article to present a review of the salient features of the experimental work that has been carried out by various investigators concerning methods of measurement of and effects produced by glare. In general, there are two methods that may be employed for the determination of the effects of glare. In one of these methods, the subject of the test is placed in the situation to be investigated or under certain arbitrarily designated sets of conditions as regards intensity and distribution of light, and is asked to report on the unpleasantness, discomfort, or dazzle produced by the sources or distributions of light employed. The second method consists in measuring, under various conditions of intensity and distribution of lighting, the effects on sensitivity or acuity of vision, and comparing the results of the tests with measurements obtained when the source of glare is removed. Such procedures have the advantage of definiteness and, therefore, of relative precision. It is to be expected that the results obtained when the presence of glare is estimated from reports of discomfort would differ from those obtained from estimations and measurements of reduced visibility. For a condition of glare that produces no detectable reduction in visibility of a standardized test object may be judged to be uncomfortable. However, a condition of quantity and distribution of light which produces a reduction in visibility is an unfavorable environmental condition for the eyes and is not conducive to general welfare, efficiency, and comfort.

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Apparatus and method of test

The investigations reported by us were conducted for the purpose of adapting some simple system (as exists in the ensemble known as the glarometer) of varying the intensity of the environmental glare field in the direct line of vision to the measurement of the tolerance of light in a group of persons presumably normal in this respect and in a group of individuals who complained of sensitiveness to and discomfort produced by light. By such procedures it was hoped that a simple and definite method of measurement of tolerance for light could be established and that it would be possible, through the determination of the "glare-out" frequency distributions in normal and photophobic conditions, to obtain quantitative data that would be of value in the physiology of vision and in clinical applications to persons who complained of intolerance of light under conditions which normally would not produce ocular discomfort nor photophobia.

The apparatus used in these investigations is known as the glarometer, and was manufactured by the Glarometer Company, Chicago, Illinois. The instru-

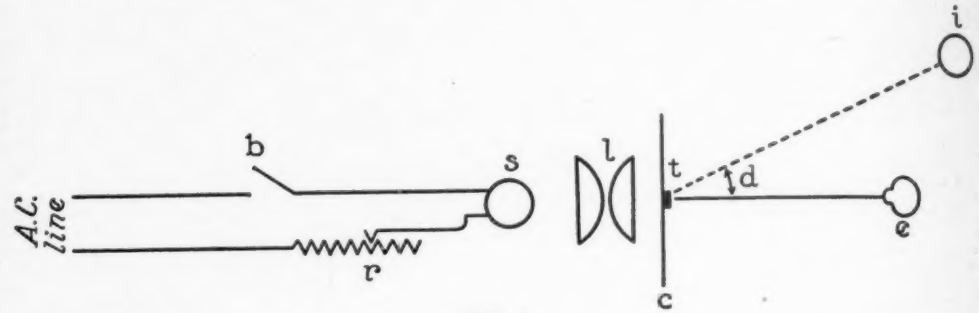

FIG. 1

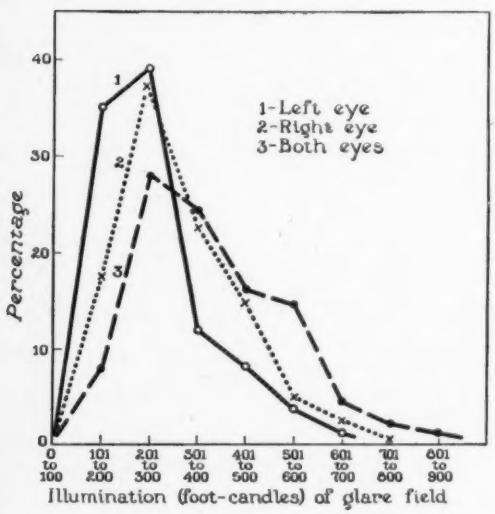

Fig. 2

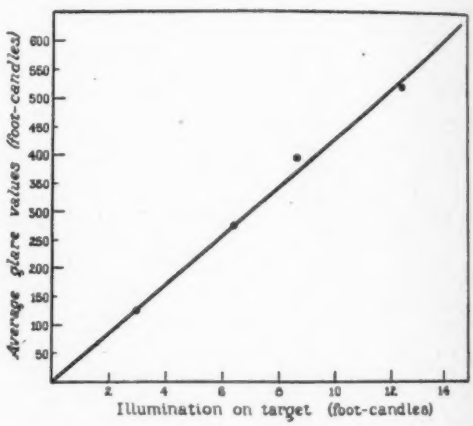

Fig. 3

Fig. 1 (Albers and Sheard). Diagrammatic sketch of the glarometer.
Fig. 2 (Albers and Sheard). Curves showing the frequency of distributions of glare-out measurements for a group of 144 individuals normally tolerant of light.
Fig. 3 (Albers and Sheard). Diagram showing the linear relationship between the average glare values and the illumination (3.1, 6.4, 8.6, and 12.4 foot-candles, respectively) on the letters of the target.

ment consists essentially of a variable resistance, r (fig. 1), joined in series with a 250-watt lamp, s, so arranged that the illumination passing through a lens system, l, may be changed readily and progressively within a range of 25 to 2500 foot-candles as measured by a photronic cell (in conjunction with a suitable multistage or combination ammeter) placed directly in contact with the glass screen, c, at its central portion. This screen was a frosted or ground piece of plate glass which served as a diffusing medium. The ground-glass screen carried a small target, t, made of cardboard and large enough to contain the word OUT in 8-, 10-, or 12-point Gothic letters. In general, 8-point letters were used, although numerous tests showed that the results concerning glare-out values were not affected by the size of the letters used. The fixation target was fastened to the side of the glass screen facing the observer, e (fig. 1). The angle, d, formed by the line of intersection of the direct light from the source, i, on the target, t, and the line of the observer, e, was 27 degrees to 28 degrees. The distance of the light source from the target and the value of the angle, d, were kept constant. The eye of the observer was situated in the horizontal plane of the target and 14 inches (35.5 cm.) from the glass screen and target.

The target was illuminated by light from a 50-watt lamp, i, during these investigations, unless otherwise stated. The illumination on the target (6.4 foot-candles) was determined by making readings with a photronic cell placed in the position ordinarily occupied by the target. (The readings of the current produced in an ammeter of suitable type by the action of light on a photronic cell may be readily converted into foot-candles.) The illumination in foot candles in the environmental field of light (used for the production of invisibility of the letters on the fixation target) on the diffusing screen, c, produced by the 250-watt lamp, l, and the lens system, s, was measured by an ensemble consisting of a photronic cell and a multiple-range ammeter. The readings on the scale (graduated from 0 to 95) attached to the glarometer were converted into equivalent readings of illumination in foot-candles on the glass screen.

All persons who were tested were untrained observers. They reported no discomfort nor photophobic symptoms under ordinary circumstances. They possessed normal vision or, if they did not possess V = 20/20, they were given satisfactory correcting lenses. Individuals with appreciable muscular imbalances were rejected.

In making tests on the glare-out values of the environmental field of light surrounding the fixation target, the intensity of illumination was increased slowly until the person under test reported inability to see the letters on the target. In general, three sets of readings (each set consisting of three to five determinations) were made and the average of these determinations taken as the glare-out value.

Glarometric determinations on a group of persons presumably normal in tolerance of light

One hundred and thirteen individuals, who reported no symptoms nor complaints with reference to intolerance of light, were tested for glare-out values of the right eye and left eye, and 144 persons were tested binocularly. The results of these determinations, grouped in units of 100 foot-candles of environmental glare-out illumination, are given in figure 2. The three curves (fig. 2) show the relationships between the glare-out values in foot-candles and the percentage of cases for each eye and both eyes, respectively. The majority of individuals possessed a higher glare-out value with binocular observation than they did when using either the right or left eye only. This would be expected on the basis of the summation theory (Helmholtz) and the fact that binocular visual acuity is normally greater than the monocular value. Furthermore, the data indicate that the glare-out values are definitely higher, in general, for the right eye than for the left eye. It is probable that ocular dominance may serve as an explanation

for this difference in glare-out values in the eyes when tested separately. Tests on ocular dominance demonstrated that the right eye was the dominant (that is, fixating) one in 73 percent, the left eye in 20 percent and that there was no preference in this regard in 7 percent of cases. The dominant eye generally had a higher glare-out value than its mate, although this was not invariably the case.

Under binocular test, the data show that approximately 80 percent of individuals examined reported glare-out of the letters on the target under transmitted background illuminations ranging from 200 to 600 foot-candles. More than 80 percent of them reported glare-out with field illuminations ranging from 100 to 400 foot-candles when the left eye was tested and 94 percent experienced glare-out with the right eye only under test with illuminations of 100 to 500 foot-candles. The frequency distribution curves of figure 2, for both the right and left eye respectively, are shifted very definitely to lower values when compared with the results obtained with binocular observation. The average value of glare-out illumination was found to be 240 foot-candles for the left eye, 295 foot-candles for the right eye, and 380 foot-candles when both eyes viewed the target.

Effects of absorptive glasses on glare-out values

In order to determine the effects of various absorptive glasses, in which the absorption in the visible region ranged from 14 to 45 percent of the incident light, on the glare-out values, a series of tests was carried out on over one hundred persons who did not complain of discomfort nor intolerance of light under ordinary conditions. Four grades of a tinted absorptive glass (designated as 1 to 4 in table 1) and two grades of smoked glass (designated as numbers 5 and 6) were used. The percentage absorption of incident light, determined from spectrophotometric measurements and by direct test with the photronic-cell light meter, of the six absorptive glass filters was 14, 18, 23, 41, 35 and 45 percent, respectively. In general, these glasses uniformly affected the transmission of light throughout the range of the visible spectrum of 700 millimicrons (red) to 500 millimicrons (blue), but showed an increasing absorption with decrease of wave length in the region of 500 to 440 millimicrons.

Table 1

AVERAGE GLARE-OUT VALUES, IN FOOT-CANDLES, OBTAINED WITH VARIOUS ABSORPTIVE GLASS FILTERS BEFORE THE EYES. (ILLUMINATION ON THE FIXATION TARGET, 6.4 FOOT-CANDLES)

Absorptive Filter		Absorption percent	Both Eyes	Right Eye	Left Eye
None		0	380	295	245
Tint	1	14	390	295	245
	2	18	375	280	250
	3	23	380	280	245
	4	41	370	280	240
Smoke	5	35	380	280	240
	6	45	370	270	240

The results obtained from the series of tests on the 113 persons who were examined are given in table 1. These data substantiate the conclusion, previously reached in these investigations, that a higher value in foot-candles of the illumination of the environmental field was necessary to produce glare-out effects with binocular observation than in the case of either the right or left eye. Within the limits of error of the experimental apparatus and procedure, as well as the manner in which the data have been treated statistically, it is evident that the placement of vari-

ous absorptive filters of the types used does not alter the values of the glare-out illumination, provided the illumination on the target and the method of testing are maintained constant. Similar results were obtained with other absorptive glasses of widely different spectral transmission. These results are to be explained on the basis that the light which is reflected by the target and which enters the eye (or eyes) is reduced in percent as is the light which enters the eye from the environmental (glare) field. Since it is known a priori that the ratio of the illumination at the target and in the environmental glare field is not altered by transmission through any given glass filter, it might be expected that changes in the glare-out values would not be produced by filters placed before the eyes of the observer. These experimental results support the conclusion that a condition of glare, in which there occurs invisibility of the object to which attention is directed, is not dependent on a specific number of foot-candles per se. A condition of glare which produces invisibility of the object of regard in an illuminated environmental field is dependent on the ratio between the number of foot-candles in the environmental field and the number of foot-candles of illumination at the fixation target.

Relationship between intensities of illumination at the fixation target and the background illuminations necessary to produce glare-out conditions

Since the experimental results demonstrated that the placement of various absorptive glasses in front of the eyes did not affect, within the limits of experimental error, the values obtained for the illumination (foot-candles) of the environmental field necessary to produce invisibility of the letters on the fixation target, it was of interest to determine the effects produced on the glare-out values by changing the illumination on the target. Determinations of glare-out illuminations were made when incandescent lamps rated at 25, 50, 75, and 100 watts, respectively, were placed in the same situation with respect to the target and observer as is indicated in figure 1. The results for the group of individuals who did not complain of discomfort from, or intolerance of, light are summarized in figure 3. The ratio between the average glare-out values (G) and target illumination (T) is practically a constant. From the standpoint of the physiology of vision, it is evident that loss of visibility of the object under observation is dependent on the intrinsic brilliance of both the object viewed and of the surrounding background.

The effects of quality of illumination of the environmental field on glare-out values

In order to investigate the effects on glare-out values produced by changes in the quality of the illumination of the environmental field, a considerable portion of the same group of individuals were examined when ground-glass filters (c, fig. 1), predominantly green, amber, and red in color, were used for controlling the intensity and character of the transmitted light. The illumination in foot-candles at the surface of the glass filter was determined by a photronic cell and a multiple-range ammeter, and the readings on the scale attached to the glarometer were finally converted into equivalent readings of intensity of illumination in foot-candles. Since the sensitivity of photronic cells varies considerably in different portions of the spectrum, it was necessary to correct the readings, obtained with any given colored glass filter, for the selectivity of response of the photovoltaic cells. Spectrophotometric data were obtained for the various filters and these data were then used in combination with the sensitivity factor of the photronic cell in various spectral regions in order to obtain reasonably accurate determinations of the light (in foot-candles) transmitted by the colored filters. The average glare-out values for the group of individuals tested were found to be 260 foot-candles with an environmental field of white light, 270 foot-candles with predominantly red light, 273 foot-candles with yellow-orange light, and 255 foot-candles with

predominantly green-blue illumination. To the first order of approximation, therefore, these results indicate that glare-out values are independent of the spectral character of the illumination employed in the environmental field used for the production of glare.

Conclusions

1. Tolerance of light in a group of 144 individuals who did not complain of ocular discomfort nor photophobia under ordinary conditions of light was investigated by glarometric methods, using an ensemble known as the glarometer.

2. In the group of individuals tested, using an illumination of 6.4 foot-candles as measured at the fixation target, it was found that 85 percent reported glare-out or invisibility of letters on the target with environmental (transmitted through diffusing screens of glass) illuminations ranging from 100 to 400 foot-candles when the left eye was tested, 94 percent experienced glare-out with the right eye under background illuminations of 100 to 500 foot-candles; whereas, under binocular test, more than 80 percent reported glare-out under the higher range of illuminations of 200 to 600 foot-candles. The average values of the glare-out illumination were found to be 240 foot-candles for the left eye, 295 foot-candles for the right eye, and 380 foot-candles under binocular test.

3. The majority of individuals tested had a higher glare-out value with binocular observation than when using either the right or left eye only. This is to be expected on the basis of the summation theory and the greater binocular visual acuity. The data also indicate that the glare-out values are definitely higher for the right eye than for the left eye. It is probable that ocular dominance is the principal factor accounting for the difference in glare-out values in the eyes when tested separately.

4. Glare-out values for 113 individuals were determined with a series of neutral and tinted absorptive glasses which reduced the intensity of the light, from both the target and the background that entered the observer's eyes from 14 to 45 percent respectively. The spectral distribution of the light transmitted by these absorptive filters was not appreciably different. Within the limits of experimental error it was found that the placement of such absorptive glasses before the eyes did not alter the values of the glare-out illumination. This is to be explained on the basis that the ratio between the intensity of illumination on the fixation target and in the background (glare) field was not altered by the use of absorptive filters.

5. The effects of changes of illumination in foot-candles at the target, carrying the test letters, on the values of the glare-out illumination of the environmental field were investigated. It was found that the ratio between the glare-out values and the illumination (3.1, 6.4, 8.6, and 12.4 foot-candles, respectively) on the target was constant.

6. A series of tests was carried out on a group of persons normally tolerant of light, by using red, amber, and green glass filters in the field employed to produce glare. The results of these tests indicate that there is little, if any, difference in the glare-out values, which is dependent on the spectral character of the illumination employed in the glare field.

INTERSTITIAL DEGENERATION OF THE CORNEA

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The author describes a condition which he considers the commonest of all idiopathic corneal metaplasias in Southern India, a degeneration that takes place insidiously in the absence of any known etiological factor, develops slowly, without irritation, affecting males most commonly from 30 years old and up. A case is given in detail with histological examination of a deep shaving, and certain differences from the condition known as Fuchs's corneal dystrophy are pointed out.

The variety of corneal degeneration illustrated is, perhaps, in some of its early phases sufficiently similar to certain aspects of the epithelial dystrophy of Fuchs to cause confusion; its later stages, however, are so different from standard descriptions of this disease that it may be regarded as a distinct condition. The appearances presented as Fuchs's epithelial dystrophy in publications from different parts of the world are so diverse, in spite of factors in common, that some of them may readily represent phases of one or more independent affections; conversely, a comprehensive study of Fuchs's epithelial dystrophy sufficiently extensive to disclose the bulk of its variations, were such a study possible, might conceivably reveal a composite picture sufficiently embracing to include not only the presumptive cases published but also other allied conditions as yet unsuspected of being but stages of the same etiological group. This is certainly true of some corneal conditions; in fact, the cornea would seem to be a favorite seat for the separation of independent affections by morphological variations in isolated cases, rather than by the identification of such diverse appearances as part of a clinical, pathological, or etiological group. Where etiology or pathology is in doubt, this is almost inevitable, unless one sees the clinical condition in such bulk as to enable all the fragments of the jigsaw puzzle to be identified as parts of the picture. I have elsewhere[1] tried to show that this is true of the condition commonly described as superficial punctate keratitis, but which more fittingly would be described as keratoconjunctivitis diversiformis et uveitis anterior, an afebrile affection which is met with in sporadic and epidemic form not associated with any causative bacterium, in so far as our investigations have gone up to date, and possibly due to a virus invasion. When this condition is seen in epidemic form, say in a series of one or two thousand cases in almost continuous succession, the variations are so numerous that it gradually becomes obvious that the disease entity, whatever its nature might be, embraces numbers of corneal conditions described as independent affections, the establishment of which, as such, has been largely based on abnormal appearances in isolated or small collections of cases. There are some who are inclined to deal with the various discrete opacities which appear on the cornea in association with different disease entities as the old clinicians did with the pox, dubbing them as punctate, macular, vesicular, and so forth, regardless of the lesson taught by the liason between the Treponema pallida and the various rashes of the great pox, or between the variola virus and the skin eruptions of infinite variety, such as are seen only when an epidemic of smallpox sweeps over an unprotected community.

To return from this digression, however, to the theme of the title: in the literature at our disposal, there does not appear to be a recognizable description of the condition we are attempting to depict, although it is the commonest of all the idiopathic metaplasias of the cornea in this part of the world. The word degeneration is used designedly, as it is not intended to assume without further evidence that we are dealing with a disease entity. Possibly this de-

[1] Government Ophth. Hosp. Rep., 1930.

generative state may occur as a sequel to several diverse provocative agents. Indeed, a similar state has been observed on at least one occasion as a late sequel to a corneal trauma with minute fragments of stone. For the most part, however, the change takes place insidiously, in the absence of any known etiological factor. Its apparently

Fig. 1 (Wright). Interstitial degeneration of the cornea. An advanced stage. The spherules are represented a little too prominently.

idiopathic onset, its slow development, the lack of irritation, and the impression conveyed when viewed with the naked eye that the affected area is surrounded by healthy cornea give it an indefinable quality which renders it readily recognizable again in the majority of instances.

Over seventy-five cases have been seen in this clinic in the past 15 years. For the most part it is an affection of the age periods upwards of 30 years, but it has been observed in a patient as young as 18 years of age. It is most commonly seen in males and frequently affects one eye only. It does not appear to be familial. Insensibility is common, but in certain cases the cornea may not exhibit this feature except over the roughened area. The picture (copy of Madras Government Ophthalmic Hospital Museum picture No. 138) illustrates a typical advanced case of which the following is the legend, written for the most part by me at the time:

V.N., Hindu, male, aged 50 years, O.P. No. 14615, dated 11-10-1922. There is a raised yellowish-brown nodular transverse patch across the cornea just below its center. The cornea above and below it is blue with haze; in less extensive cases this haze may extend for only a short distance, leaving a clear cornea peripheral to it. The other eye was similar in every respect. The conjunctivae, lids, and sclerae are normal. Round semi-dilated pupils may be seen through the clearer portions of the corneae above. The orbital muscles are normal. The tension is normal. There is no exposure of the eyeballs during sleep. Cotton wool may be drawn across the cornea above without causing the patient to wink. On the skin of the face and lids the same stimulus is felt. On looking closely at the heaped-up yellowish area it is seen to be composed of small globular masses projecting above the surface, not as

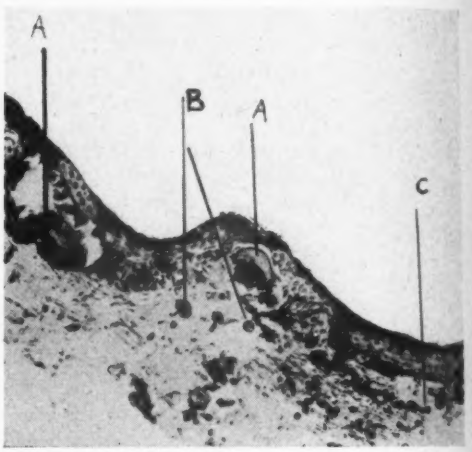

Fig. 2 (Wright). Section of cornea, low power. At A, B, and C are seen large, medium, and small masses of the fatty acid referred to in the text. They appear black in most photographic prints but are amber colored in the sections. The photomicrograph is chiefly intended to show the disposition of these masses.

regular as a mulberry surface, somewhat more patchy. For the most part it does not stain, but in the depressions between the globules, the opaque gutters take the stain in some places. In early cases of this condition there may be only a very small patch of hazy roughness in one eye, unevenly opaque, and not yet yellowish, suggestive of

the changes produced by high tension where bullous keratitis supervenes. At this early stage it may be observed with the loupe that there are discrete spherules in the substantia propria towards the center of the affected area, which gradually decrease in size to fine translucent droplets, and fade away peripherally as a haze. But even in early cases some of the discrete droplets may be distinctly yellow and oily looking. The epithelial surface may show a small area of abrupt irregularity or may be level. Staining may be absent, confined to a few points near the center, or ill defined and diffuse. It is, however, clear that the condition cannot be regarded as an epithelial process, since the substantia propria is also involved. The well-developed condition seen with the corneal microscope is found to consist of globules partially projecting above the corneal surface level, and partially occupying the substantia propria. The epithelial surface is for the most part smooth and shining—although morular—the epithelium being continued over the little elevations. The intervals between the globules are in places opaque and granular, and yellow necrotic looking material may be present anywhere in the affected area, either between globules or in the center of a globular mass. The larger globules often give the impression of being full of an amber-colored oily fluid, presumably a type of fatty degeneration which is typical of the established condition. The surrounding cornea is hazy, and shows throughout its substance small, clear, highly refractile points like tiny dew drops or fine particles of crystal. They are larger near the rough area, and become smaller and smaller till they finally are no longer discrete, but diminish to form a haze which tails off into clear cornea. They are definitely situated below Bowman's membrane. This arrangement suggests that the finer droplets which one sees at the periphery gradually evolve to form the larger spaces filled with more opaque material in the middle zone, and finally develop into the larger macroscopic globules of the central region with their semi-opaque or amber-colored oillike contents.

The sequence of appearances is analogically reminiscent of the classical march of cloudy swelling and fatty degeneration, with a massive extracellular increment of the end products rather than a terminal intracellular change. In many ways the condition was suggestive of an atheromatous process, and before an opportunity for histopathological examination occurred one formed a mental picture of a degenerative process along analogous lines.

Exploration of the rough area with a needle or light curette showed that the thickened portion of greatest change was friable and came away readily in broken fragments, leaving a honeycombed floor of epithelium and substantia propria. I can see nothing in the standard works of corneal microscopy which would lead one to think that the description of any condition therein recorded was intended to reflect a recognition of this degeneration. Figure 44 in Koby's "Slitlamp microscopy of the living eye" (translated by Goulden and Straus, 2nd edition, page 126) is intended to represent Fuchs's epithelial dystrophy.

When looked at sympathetically, with a wish to visualize all its possibilities, this is the nearest thing I can see in the literature at my disposal to the globules or spherules—not bullae—which are to be seen in the affection under consideration. In Koby's text refering to this figure, it is said that the bullae contain a clear fluid. This may be characteristic of Fuchs's epithelial dystrophy, but it is certainly not so of the corneal degeneration referred to here. A bulla, by long usage, has come to mean a bleb or blister of a surface layer which is raised from a more or less flat bed by fluid distension. The average individual would accept this idea of a bulla, but the small spherical cavities full of clear or opaque, semisolid or oleaginous material, as the case may be, which we meet with in the degeneration under discussion, start in what one would prefer to call vacuoles or spherules or minute cystic cavities. They commonly appear as either spherical or anteroposteriorly compressed globules from the start and give the impression of being situated in the anterior half of the substantia propria. Although in their early stages they seem to contain a clear fluid, they ultimately contain either opaque pultaceous detritus, or amber-colored material of a thick oily or semisolid consistence or both. It sometimes appears on careful examination with magnification that the globules, which at first give an impression of oil globules, may not be of curved outline, but rather angular or irregular fragments. This tallies with what one finds when a portion of the tissue is teased under the micro-

scope and the yellow material examined. It is more waxy than oily in consistence and does not run into droplets, although it leaves a greasy surface on glass when rubbed with a needle. Sometimes the greasy material is pale, not amber, like particles of paraffin.

On looking through my notes of cases which might present any special features, I find that in 1920 I thought that this might be a fungoid affection, and made a number of bacteriological investigations with the idea of isolating a mold or other local parasitic agent. The bacterial findings were negative and only on one occasion was a mold isolated. This proved to be nonpathogenic to animals (rabbits, guinea pigs, monkeys) when planted on the cornea. The results of these investigations were taken as negative and the work abandoned.

Sometimes pigment deposits were noted on the endothelium; in other cases this was not so. There did not appear to be any suggestion of related iridocyclitis, nor a necessary association with glaucoma, although the condition has been observed in glaucomatous eyes. There was no definite association with syphilis, but syphilis was present in some cases. Bulging of the posterior corneal surface was not observed. It is hardly necessary to say more in introducing this degeneration, perhaps the commonest South Indian degeneration of the cornea. Without my knowledge it may be well recognized elsewhere. It is not perhaps of great practical importance, but as I have been asked frequently by postgraduates if it were not Fuchs's epithelial dystrophy and often felt constrained to reply that I hardly felt competent to delimit the variations of the epithelial dystrophy of Fuchs, I thought a note on the subject might not be without academic interest.

We have attempted curettage of the affected area and cauterization with the idea of producing a smooth level scar, but as might be expected this is not a success. As treatment does not improve vision, iridectomy may be called for. Owing to the insensibility, symptoms are not such as to urge the patient to seek attention unless both eyes are involved, when the visual disturbance prompts a visit to the hospital. I do not know the average eventual fate of an eye affected by this degeneration, as it has not been possible to follow up undisturbed cases. Pyogenic infection and panophthalmitis have been observed. Uncomplicated perforation due to deep corneal erosion has not been noted, nor would it appear likely except in the event of secondary infection and consequent ulceration. Sequestration of the friable mass followed by indolent ulcer has not been seen, although one might almost expect it, but fragmentary shedding of friable debris is probably responsible for some of the opaque-staining depressions.

Up to the present it has not been possible to get a whole cornea for histopathological examination, nor yet a through-and-through disc, but preparations from a shaving which appeared to go deep to the grossly altered cornea and leave behind a portion of translucent substantia propria, have been obtained.

The following report on preparations from such a deep shaving was kindly furnished by Dr. T. Bhaskara Menon, pathologist at the Stanley Medical School in Madras.

As to the histology of the degeneration in the cornea, I have stained the slides with different stains: von Kosa's for calcium, van Geison, Mallory, stains for hyaline, eleidin, keratohyaline, and stains for fat (osmic acid, scarlet red, and Nile blue).

The connective tissue of the cornea proper shows the peculiar degeneration you have described. A few capillary vessels can be made out in this tissue and the degenerative change seems to start in the fibers round about these vessels. Small globules of a yellow color appear in between the fibers. These are at first very small, about 1 μ in size, but gradually grow larger to 10 and 12 μ and become somewhat ovoid in shape.

The corneal fibers seem to become separated. These globules gradually increase in size and fuse together to form rounded and more irregular masses. The corneal fibers gradually become broken up and the irregular crystalline masses appear to be close under Bowman's membrane and in places burst through the corneal epithelium. The epithelium itself shows marked proliferation. It is more than six cell layers in thickness in many places, and some of the nuclei show hyperchromasia and division figures. The

surface layers seem to have undergone keratinization.

As regards the nature of the abnormal substance, it is not an epithelial product like keratine, eleidin, or keratohyaline, as it does not give the staining reaction. It is also not hyaline nor calcium. As far as I can make out, it gives the staining reaction of fatty acid (blue with Nile blue). It is negative to osmic acid, scarlet red, and Sudan III. It is possible that neutral fat has all been dissolved out by the embedding process. It does not seem to be doubly refractile. On the whole, the appearance suggests some abnormal fatty substance which is not easily stained. But unless we get frozen sections from another piece it is not possible to be more definite.

The histology is very similar to that of atheroma of a blood vessel, regarded by some as a cholesterol steatosis due to infiltration of the vessel walls with cholesterol.

To this I have nothing to add except that biomicroscopically, vascularization is not a feature. The early distribution of the affected area is commonly a narrow, ovoid, isolated island just below or near the center with which, in at least some cases, no vascular connection was traceable. Possibly fine deep channels may have been overlooked. In a distribution where a part of the areolar haze reached close to the limbus it would be quite easy to miss vessels, and this pattern is sometimes seen. Quite recently a distribution has been observed somewhat similar to a band keratitis, reaching the limbus on either side (but not showing an expansion there). This is unusual and together with the fact that the surface of the epithelium was nowhere irregular, suggested that one was dealing with a different process; but the compressed oil-globule appearance, sized larger at the center, smaller towards the periphery, till the yellow gave place in the smaller series to colorless, translucent, refractile material—like edematous fluid droplets—seemed to clinch the diagnosis. The yellow material formed in this peculiar type of degeneration—which ought to be easy to define histopathologically when sufficient properly fixed material is forthcoming—may be a common product of several toxic agencies, but it would appear to be the prominent feature of the condition under reference. For diagnostic purposes one obviously cannot adopt it as a criterion, for in early cases it may not be seen biomicroscopically, and it is not desirable to examine the tissue for fatty acid. One hardly needs such a specific test for the condition, provided its various clinical features have been previously observed and appreciated. In the majority of cases members of the staff who have studied the affection have little doubt about its identification. Dr. N. Naidu has recently selected for me, macroscopically, several atypical cases in the out-patient department, for further investigation and his diagnosis has proved correct on examination with the corneal microscope.

The photomicrographs do not give so good an idea of the tissue change as one would wish. The homogeneous rounded and irregular masses show up well in the slides because of their deep amber color, but not so in the prints. The specimen was not cut and stained with a view to reproduction but rather with the idea of selective staining, so that Colonel Shortt, who kindly took the photomicrographs had little to choose from. It is hoped that an opportunity may be forthcoming on a future occasion to obtain a through-and-through preparation suitable for fresh staining reactions and photomicrographic preparations in amplification of the present illustrations. Now that large discs can be removed from such eyes and advantageously replaced by grafts, the histopathological investigation of such corneal conditions ought not to be so infrequent.

Government Ophthalmic Hospital.

NOTES, CASES, INSTRUMENTS

FUNGUS INFECTION OF THE LACRIMAL CANALICULI

ROBERT MCCLANAHAN, M.D.
NEW YORK

The clinical picture known as "tear stone" was described as long ago as 1670 by Cesoni. Von Graefe reported 10 cases from his own clinical experience and his description of these cases can be improved upon very little. The clinical picture is as follows: There is a fullness over the upper or lower canaliculus accompanied by a creamy-yellow discharge from the punctum. There is usually no obstruction and only moderate swelling. A marked conjunctivitis usually accompanies the infection. After the condition has existed for several months a small palpable calculus may be formed within the dilated duct.

Smears generally show a mixed infection consisting of various secondary pus-forming organisms in addition to the chief offender. The fungi that are usually found appear as isolated, thin, hairlike straight or slightly curved filaments. They usually have slightly branching ends that are sometimes difficult to see. These organisms stain with iodine solution and may be grown on suitable anaërobic culture media.

The name Streptothrix försteri was first applied to these organisms by Cohn. This was to differentiate them from Streptothrix buccalis, which is thicker and does not branch. These organisms are similar in that they both seem to be connected with the deposition of lime salts. The Streptothrix buccalis is believed to be responsible for the deposition of tartar on the teeth. The leptothrix (nonbranching form) was formerly believed to be the causative agent of the condition described above but, according to Collins and Mayou, it is very doubtful if this ever occurs.

Throughout the literature there is much confusion in the use of the terms leptothrix, Streptothrix försteri, and Streptothrix buccalis. Polymorphism further complicates the picture. The term trichomycetes or "hair molds" as suggested by von Petruschky is the least confusing, as this includes all of the hairlike molds.

All of these organisms are relatively nonpathogenic and have been injected quite harmlessly into the blood stream of rabbits. However, evidence points to the fact that, of these organisms, at least the Streptothrix försteri can give rise to a definite pathological condition in the lacrimal passages where they seem to find ideal conditions for growth.

Case report. J.R., a white male, 14 years of age, was first seen on June 24, 1935. There had been redness and secretion of pus in the left eye for about two months, and instillation of argyrol and frequent cleansing had led to no improvement.

There was no history of any previous infection. The boy was in good general health. He had been in the habit of doing a great deal of swimming and diving in polluted water—the lower Hudson River.

Examination showed a normal right eye. In the left eye, a marked conjunctivitis was confined largely to the palpebral conjunctiva with the upper and lower lids equally affected. There was a slight edema of the lids. Pressure on the tear sac at this time produced no pus. A routine smear was taken and following this the lacrimal sac was washed through the lower canaliculus as a diagnostic measure. The fluid passed easily into the nose and no pus was observed.

The smear was examined by Mr. Edgar B. Burchell of the New York Eye and Ear Infirmary who found the following organisms: numerous Streptothrix försteri, pus cells, and pneumococci. He recommended investigation of the upper canaliculus.

Accordingly, on the next examination attention was directed to this area with the following result: Deep pressure over the upper canaliculus caused the expulsion of approximately one-half

cubic centimeter of thick pus which was slightly chalky. Microscopic examination of this material did not show any fungus mass but simply numerous isolated organisms and pus cells. The hair-like molds were in great abundance in every smear taken. No cultures were made.

Treatment consisted in the instillation of Reese's mixture (carbolic acid, glycerine, and iodine) into the upper punctum and daily irrigation and expression. However, in spite of this treatment, the condition persisted for three weeks with constant secretion of pus from the upper punctum.

Finally merthiolate solution (1:2000) was injected into the punctum each day and a 1:5000 merthiolate ointment given for home use. Within a week after this treatment was instituted the secretion stopped and the conjunctiva became normal. (This may have been a coincidence and is not essential to this report.)

Conclusions

1. It is possible that the "hair molds," Trichomycetes, may be a more frequent cause of eye conditions than is now generally supposed. (Kip reported the frequency of these cases as 1 in 50,000 eye cases.)
2. Routine conjunctival smears led to the diagnosis.
3. The effect of the drug merthiolate (Lilly) deserves investigation.

60 East Seventy-fifth Street.

AN UNUSUAL CASE OF MYOPIA

LINN EMERSON, M.D.
ORANGE, NEW JERSEY

On September 6, 1932, Miss Koch, a field worker for the New Jersey State Commission for the Blind, brought to me a girl, aged six-and-one-half years, for advice as to whether to place her in the sight-saving classes of the public schools, or in an institution. She had been taken to a half-dozen oculists and clinics and had been told that nothing would be done for her. Her school teacher had reported that she was making no progress.

She was wearing —5.00 D. spheres, prescribed by a prominent oculist. A myopia of about 26.00 D. in the right eye and 28.00 D. in the left eye was found by retinoscopy. The ophthalmometer showed astigmatism with the rule, 2.00 D. at 15° in the right eye and 3.00 D. at 165° in the left eye. Vision O.D. was 20/200 with —25.00 D. sph. and O.S. was 20/200 with —26.00 D. sph.; cylinders did not improve vision.

It was decided to attempt the correction of the myopia and the following prescription was ordered: O.D. —12.00 D. sph., O.S. —14.00 D. sph. It was my intention to increase the correction two diopters at a time, taking the left lens for the increased right each time, thus lessening the expense. She accepted her correction so rapidly, however, that a four-diopter increase could be given at a time.

By November 11th the patient accepted O.D. —24.00 D. sph. and O.S. —26.00 D. sph. Vision was 20/100 with each eye, and she could read Jaeger No. 3. On March 3, 1933, vision was 20/50.

On July 5, 1934, she had outgrown her frames, so I tested her again under homatropine and ordered O.D. —23.00 D. sph. ⊂⊃ —3.00 D. cyl. ax. 15°; O.S. —26.00 D. sph. ⊂⊃ —2.50 D. cyl. ax. 165°. On September 12, 1935, I again refitted her under homatropine and ordered O.D. —24.00 D. sph. ⊂⊃ —3.00 D. cyl. ax. 15°; O.S. —25.00 D. sph. ⊂⊃ —3.00 D. cyl. ax. 165°.

On October 5, 1935, she returned to have her glasses checked, and read 20/30 with each eye. Her proud mother reported that she was leading her class in public school.

Metropolitan Building.

SOCIETY PROCEEDINGS

Edited by Dr. H. Rommel Hildreth

MINNESOTA ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

Section on Ophthalmology

October 11, 1935

Dr. H. E. Binger, president

A case of trachoma

Dr. William A. Kennedy (St. Paul) presented Mr. S., who had been seen four weeks after the trouble with his eye began. He had been treated for corneal ulcer. In addition to this, he had had a marked atropine conjunctivitis. Following foreign-protein treatment, the ulcer disappeared in about ten days.

Four months later the other eye began to feel painful and there was a slight purulent discharge. The conjunctiva was quite velvety and the eye photophobic. At that time he was treated by the writer with two-percent silver nitrate and about two weeks later an ulcer developed. Since then he has had one ulcer after another. The lids would clear up for a time and then become involved again. The patient's Mantoux test was positive but the general examination negative. He has been given a course of tuberculin and stimulating doses of salvarsan. Because of the recurrence of the lid trouble with corneal changes, he was treated for trachoma for a period of four or five months but no improvement resulted. At present, the lid changes and pannus make a typical picture of trachoma.

Discussion. Dr. Paul G. Berrisford (St. Paul) said that this case appeared to be one of trachoma for the following reasons: the disease affected both eyes and was of long standing; there was a marked infiltration of the upper tarsus and its conjunctiva, so much so in the right eye that there was a plainly evident ptosis; pannus affecting both eyes, more developed in the right, involved the upper part of the corneas; there was scarification of the left upper tarsus.

Dr. V. J. Schwartz (Minneapolis) stated that he had seen this case at the request of an insurance company. He felt that there was not much question but that the patient had trachoma in the right eye now, but he disagreed with the diagnosis of trachoma in the left eye on the basis of its present appearance. In the first place, one would have to examine the conjunctiva of the left upper lid very minutely to discover any sort of a scar, and even then it was doubtful. If trachoma had not been found in the right eye one would never think of looking for it in the left. Further, the nature and position of the opacities in the left cornea were unlike those of trachoma. A typical pannus, as is well known, spreads downward from the circumcorneal conjunctiva and limbus and shows very definitely a vascularization which leaves a more or less continuous opacity, even if the case becomes quiescent. This condition was well typified in the patient's right eye; but in the left eye a number of rather dense, isolated opacities remained in the center of the cornea and a few smaller opacities peripheral to these, but there was no evidence of continuity. There was no reason why the patient could not have had a keratitis due to a focal infection, or some other cause, in the left eye, and a trachoma in the right. If the position were taken that the left eye also was trachomatous, then surely it was an extremely atypical manifestation.

Detachment of the retina

Dr. R. O. Leavenworth (St. Paul) reported the case of a man whose condition had been discovered in the course of a refraction five weeks previously. A +12 D. lens was needed to reverse the shadow; the detachment furnished the explanation. The swelling was roughly circular in outline and extended laterally from the disc about three disc

diameters. There was no pigmentation in this area, the surface was undulating but there were no folds. The vessels were distinctly red with no suggestion of the black vessels seen in a serous detachment. Below, and extending well up the nasal retina, was a massive serous detachment. The patient had had light perception in the lower and temporal fields, but this had rapidly failed until today there was vision only in a small inferior field.

The history revealed that he had not been seeing well in this eye for at least seven years; that he had no knowledge of any injury to the eye; that his refraction had been tested three years ago, at which examination the oculist diagnosed an amblyopia ex anopsia; and that the eye had not been troubling him in any way except by poor vision. He complained of symptoms of eye strain in the other eye, which was moderately hyperopic.

The eye was soft. Transillumination was perfectly clear but it was difficult to reach the detachment with the transilluminator. These two findings spoke against a diagnosis of neoplasm, but such findings were certainly possible in the first stage, at least, of tumor.

This was an absolutely blind eye. If the eye were a liability, the patient would probably be better off without it even on a questionable diagnosis.

Discussion. Dr. F. E. Burch (St. Paul) said he had seen Dr. Leavenworth's case some weeks ago. The appearance of the detachment was not characteristically lobular; there was a blue-ointment patch involving the macular area, and transillumination was clear below, as it was also when again examined a few days ago. The majority of the men who had seen this patient differed with Dr. Burch about the diagnosis, but he recalled a patient with a flat bluish-colored area in the choroid which he had watched for many many years and from which there developed a tumor at the exact site of the choroidal involvement. He thought that probably those who believed that Dr. Leavenworth's patient had an unusual neoplasm were right. The specimen from Dr. Burch's patient had been leucosarcoma. It being the patient's only good eye, Dr. Burch said he had waited two years before enucleating the eye, although the growth had been easily observable and definitely tumorous. It had been thoroughly cross-fired in X-ray treatment by Dr. Stenstrom at the University Hospital; but subsequently glaucoma had developed, and the eye had been removed. After thorough radiation, the tumor did not appear to undergo further increase in size, and when removed it measured about 6 mm. in diameter. To date, after about one year, there had been no orbital recurrence nor evidence of metastasis.

In Dr. Burch's opinion there was no occasion for haste in enucleating the eye that was the subject of Dr. Leavenworth's report. The "blue-ointment patches" in the macular area, with the long history of six or seven years of impaired vision, made Dr. Burch doubtful about doing anything radical except after longer observation. He believed it best to irradiate the eye and watch it. One could not, at present, be sure that it was really a neoplasm, and the patient did not wish to part with his eye.

This brought up the whole subject of irradiating eye tumors. Only two days ago Dr. Burch had seen a tumor of the ciliary body on which an opinion had already been given elsewhere that the eye should be enucleated and the socket subsequently treated with radium. Dr. Burch, on seeing it, had advised irradiation and removal after four weeks. There is a good deal of controversy about the best means of preventing recurrence and metastasis, when the neoplasm is in the uveal tract. The consensus of opinion, Dr. Burch believed, is for preliminary irradiation, waiting for a time until the full effect of thorough radiation is possible, and then proceeding with the enucleation of the eye. Dr. Burch said this had been his method for several years past, except in the presence of glaucoma. After irradiation, glaucoma might be hastened, even in cases in which there was a growth outside the globe. He had observed glaucoma on several occasions after irradiation for orbital tumor or external malignancy.

In the case presented this evening,

Dr. Burch considered the detachment below might be secondary to the primary pathology in the macula, or the detachment might be associated with a flat sarcoma, which is quite uncommon.

Conical cornea

Dr. E. R. Bray (St. Paul) reported the case of Miss L. S., aged 33 years, whose vision at the present time is right eye 8/200, left eye 10/200, because of conical cornea. The vision of the right eye can be improved with glass to 20/200; the left, to 20/50. There is marked conical cornea in each eye. With contact glass over the right cornea the vision can be improved to 20/65 partly.

Callahan operation for chronic dacryocystitis

Dr. C. N. Spratt (Minneapolis) read a paper on this subject which will be published in this Journal.

The refraction of children

Dr. Elmer O. Dahl (Minneapolis) said that in his opinion the refraction of every child upon attaining school age should be tested under a cycloplegic. The examination should be done regardless of whether the child manifested the slightest abnormality, either local or remote. The ideal time is just before the child begins school. Of course there are cases in which the test should be made at an earlier age, notably in the presence of strabismus. As to the choice of cycloplegia, there is some variance of opinion. In a series of 50 young children chosen in sequence, the refraction was tested first with homatropine and then with atropine. The homatropine was found to be slightly less efficient than atropine, but its action had the greater advantage in that it disappeared so rapidly. Whenever a more complete paralysis is desired, such as in cases of convergent strabismus, atropine should be chosen.

The routine fundus examination may reveal lesions of the eye which would be a serious handicap to a child beginning school life. Many of these might not affect central vision and, therefore, would not prevent 20/20 vision.

Thorington states that, in infancy, nearly all children are hyperopic. This hyperopia, he says, gradually decreases until at adolescence a state of emmetropia is reached. Tenner, in New York, found 91 percent of the children at the age of five years to be hypermetropic, in a series of 4800 cases. He found that only 48 percent remained hyperopic at the age of 16 years. Other authors consider hyperopia to be permanent. Dr. Dahl said he did not know what the usual refractive error of infants is, but he had had the opportunity of observing 10,000 children in a series from five or six years of age until adolescence, and had not seen this gradual lessening of the amount of a major hyperopia in more than a few cases. Practically speaking, we do know that the amount of hyperopia does not increase, nor does the amount of myopia decrease to any appreciable degree. Therefore, if the child's refraction is tested under cycloplegia once and hyperopia is not found, it should not be necessary to repeat the test so long as his vision remains normal. The only error that will develop is myopia and that will be revealed by defective vision.

In an analysis of 2500 cases, Clark has found the following: the same refraction in both eyes 657, emmetropia 9, hypermetropia 63, myopia 22, astigmatism 563, anisometropia 1843. This analysis shows the very striking preponderance of astigmatism. Duke-Elder states that the correction of very small errors frequently results in unexpected and dramatic relief.

Most authors agree that the best treatment for myopia is a full correction, the avoidance of unnecessary reading, participation in outdoor sports, and the promotion of the general health. Myopia in children must be considered to be potentially progressive and the vision should be checked at least every six months. There is a hereditary tendency, and Harmon found this to be present in nine percent of the children tested. Many theories are given as to the predisposing and underlying etiology. It is a developmental defect.

Dr. Dahl has observed two sets of identical twins with progressive myopia. The findings in one set were described. On entering school the vision

was normal. At the age of seven years a visual defect was noted and corrected. There was 1.50 diopters of myopia. The amount of myopia was very nearly the same in both twins. For 18 months it remained stationary, then progressed another diopter, and again remained stationary for a period. The other set of twins had a similar course. This identical development of myopia in identical twins has made him suspicious that our treatment is of little value insofar as the progression is concerned. He has been unable to find any reference to similar observations in the literature.

In our school system there is a child-guidance clinic for delinquent and incorrigible children. These children are carefully studied, and reasons sought for the delinquency. More and more of these children are recommended for tests of refraction, and many brilliant results are obtained when refractive errors are corrected. Then, there are children who do not quite get into the delinquent class, but who are ill-natured and a care to their mothers. Often these, with properly fitted glasses, become happy and lovable children.

Still another class is comprised of the subnormals. These are grouped together in our schools so that they will not be a drag on the progress of normal children. Glasses often help them enough so that they are able to join in the class work of normal children. Children whose vision cannot be brought up to certain standards, or those who suffer from asthenopia due to high refractive errors, should be segregated and given special consideration.

Walter E. Camp,
Secretary.

WASHINGTON, D.C., OPHTHALMOLOGICAL SOCIETY

November 4, 1935

Dr. James M. Greear, Jr., president

Marfan's syndrome

Dr. Horace E. Allen demonstrated a case of this condition in a 40-year-old white man, six feet seven inches in height and weighing 200 pounds. He had always had defective vision but had received little benefit from glasses. Since the loss of these glasses he complained of blurred vision, diplopia, and headaches. The pupils, which were oval and displaced downward nasally, dilated but little with atropine. The lenses showed irregularly distributed opacities; the fundi, extensive pigmentary degeneration. The patient's father weighed 260 pounds and was six feet four inches in height; otherwise no familial nor hereditary history was obtainable. The roentgenological and serological examinations were negative. There was slight scoliosis. The hands and feet did not show typical enlargement.

Recurrent alternating third-nerve paralysis

Captain Robert F. Bradish of Walter Reed Hospital presented a patient, a Master Sergeant in the Army, who had had the first attack in the left eye in 1928, upon returning from a jungle survey in Panama. Tonsillectomy and dental extractions were performed and the symptoms disappeared in six months. In 1931, there was a recurrence from which he recovered in six months without treatment. In 1935, the right eye became involved, with complete recovery in four months without treatment.

The present attack began in January, 1935, in the right eye with improvement until July, when the condition became much worse and the lateral rectus became involved. The ocular examination was otherwise essentially negative. The physical condition was normal except for the presence of an upper right molar root fragment.

Discussion. Dr. G. Victor Simpson suggested the possibility of multiple sclerosis.

Dr. William Thornwall Davis suggested that since the patient had been in the tropics the condition might be an atypical manifestation of subtertian malaria or other tropical disease.

Dr. S. B. Muncaster spoke of a similar case with multiple sclerosis in which recovery followed the use of large doses of quinine.

Dr. Benjamin Rones suggested that

inasmuch as an exhaustive physical examination had been negative, fever therapy was indicated.

Ocular pathology of diabetes

Major Raymond O. Dart gave an interesting and concise illustrated summary of this condition.

The value of ophthalmoscopic examination in the diagnosis of systemic disease

Dr. Wallace M. Yater, Professor of Medicine of the Georgetown University Medical School, presented a paper on this subject, which was published in this Journal (April, 1936).

Ernest Sheppard,
Secretary-Treasurer.

ROYAL SOCIETY OF MEDICINE, LONDON

Section of Ophthalmology

November 8, 1935

Mr. Ransom Pickard, president

Macular sarcoma

Mr. Humphrey Neame said that his patient was a married woman, whose vision was, right eye 6/9, left eye 6/9 partly. Two months ago the pupils were dilated with homatropine: the right eye showed a slightly pale, discrete patch to the superior nasal side of the fovea, equal to about one-fourth disc diameter. No hemorrhages were seen. The left eye showed an ill-defined, rounded prominence of slightly paler color than the surroundings, in the macular area. There was a small hemorrhage near a transverse superior temporal vessel. A lateral measurement at the macular level showed from 8 degrees on the left to 15 degrees on the right. During the last two weeks the pigmented area had definitely increased in size, so that it now stretched across the lower third of the swelling. In addition the hemorrhage to the temporal and inferior temporal side had definitely increased. This was posterior to the retinal vessels.

Discussion. Mr. Leslie Paton said he saw a similar case in association with the late Mr. Treacher Collins shortly before his death. They both considered it of so doubtful a nature and the sight was so defective that excision of the eye was carried out. It turned out to be a cystic condition in the choroid, evidently hemorrhagic. Seen recently, the patient had an exactly similar condition in her other eye, and there was no trace of growth about it.

A congenital retinal anomaly

Mr. Frank Law and Miss Ida Mann made contributions on this subject. Mr. Law said his communication dealt with two specimens illustrating the same anomaly. They had been sent for examination to the pathological department of Moorfields Eye Hospital. The first was sent by Mr. R. J. Coulter, of Newport. It was the eye of a female child, six years of age, and it had been excised under the suspicion that it contained glioma. There was a massive exudate over the ciliary body, and a curious distribution of the growth. The child had healthy parents, and one brother and one sister, both well. The mother had not been exposed to X rays during her pregnancy. No external abnormality was noted. Section was made in the sagittal plane on the nasal side, just clear of the lens. There was a thick cord, 2 mm. in diameter, running from the disc to an attachment at the extreme temporal equator of the clear lens in the horizontal meridian. From the anterior end of this cordlike structure there passed two expansions to be attached to the structure in the region of the ciliary body. These were reflected backwards on the inner tunic of the globe, in a fan-shaped manner, as far back as the ora serrata, fading into the inner tunic. The upper expansion was further reinforced by a web of embryonic tissue, found to be a sort of retinal mesentery. This extended the whole length of the cord. The cord was very vascular and very firm to the touch, and was connected with the disc, lens, and web. Along the line of insertion of the web were seen dense white bodies which seemed to be formed by calcareous depositions in the tissues.

The second specimen was the right eye of a boy aged 22 months. He had

been noticed to have a right convergent strabismus for four months. The anterior chamber was found to be shallow and the pupil was sluggish to light. There was a localized opacity in the outer and lower part of the lens, and an indefinite gray raised area, band-shaped, in the vitreous, with what seemed to be normal retina above and below it. As glioma was suspected, the eye was excised. A few weeks before this was done, the vision of the left eye was noticed to be subnormal, and, on examining it at the time of the excision, a grayish band was found across the fundus, roughly similar to the appearance in the right eye. There could be little doubt that the specimens resemble each other.

Miss Ida Mann expressed her indebtedness to Mr. Law for having made clear a condition which had been puzzling her for years. She could show other interesting aspects of the condition. Including these just described she had now found eight cases of a similar affection, and would submit a suggestion concerning the embryonic mechanism responsible. In the first case of this nature that came under her observation she did not realize that it was one of a group of similar cases, but reported it as an isolated anomaly. The next example she saw in both eyes in a baby at Moorfields: she had also seen it in a girl aged nine years, and had received a report in another case from Mr. Somerville Martin. She was also familiar with the case recently published by Stella Ancona in the Netherland Journal of Ophthalmology, and had recently heard from Professor Weve that he is publishing further cases this month.

Concerning the possible embryology, it seemed to the speaker that the presence of some trace of the hyaloid artery in the region of the fold in most of the cases might have some bearing on this, and she advanced, as a tentative explanation, the possibility that adhesion of the primary (vascular) vitreous to the inner layer of the optic cup in one meridian might be the determining factor. If the secondary vitreous failed to form along this meridian, a fold of retina would be pulled up into the interior of the eye. The cause of the adhesion must remain unknown. The varying situation of the fold showed it had nothing to do with the fetal fissure, and the fact that it was sometimes bilateral and symmetrical seemed to exclude inflammation or fortuitous organized hemorrhage as the cause. At present it appeared to be a rare anomaly, but, since most of the cases were at first suspected of being glioma and later were diagnosed as pseudoglioma, it was possible that it was not rare, but had seemed so because it had escaped recognition.

Fuchs's epithelial dystrophy

Mr. J. H. Doggart said this is a rare, slowly progressive bilateral disease, of unknown causation, which affects elderly people, especially women, and for which no cure has yet been discovered.

The first case was that of a woman aged 70 years, whom he saw for the first time some years ago. She had been coming up every few months for inspection, for she had had a hypopyon ulcer in the right eye, the cornea of which was now more than half covered by a dense vascular scar. The left cornea was hazy, but showed no vessels. There was no history of trauma, nor evidence of inflammation other than a mild conjunctivitis. The tension of the eye was normal. Endothelium did not exist in any recognizable form. The glittering mosaic normally covering the back of the cornea had been replaced by a layer of granules resembling red pepper in appearance. There remained no trace of cell structure. He had seen 11 other cases of the condition. One of them well illustrated the mistakes that were possible when the ophthalmologist is confronted with this condition. The patient of whom he spoke was aged 72 years. For some time she had noticed that her eyes seemed "sticky." Another ophthalmologist had told her she had conjunctivitis and vitreous opacities. She had been able to see later in the day better than in the morning. Her fields of vision and her fundi were normal. There was a faint central haze on each cornea, she had marked edema of the epithelium in

both eyes, and there were a few irregular striae in various layers of the substantia propria. In each cornea the sensation was diminished. He was able to assure her that she did not have cataract, nor anything that required operation. She began to notice the halos which are natural with epithelial edema. He saw her at intervals in the next two-and-one-half years, and she is still able to see 6/9 partly. There is no glaucoma.

Fuchs, in his Bowman Lecture of 1902, spoke of a corneal condition in elderly people which could simulate glaucoma, and speculated on the possibility that this condition might be due to some disease of the endothelium, a brilliant guess which, however, Fuchs did not follow up. In 1910, Fuchs published a very long paper, with carefully worked-out clinical observations, on 13 cases of the condition which, in that year for the first time, he called "Epithelial dystrophy of the cornea." Nine of the cases were in women, and all were elderly. In three of those cases a chronic glaucoma developed.

Intermittent conjunctivitis is common, and as time progresses there is an increasing tendency for blebs to rupture, exposing the cornea; hence there is a risk of infection, and ulceration of the cornea has been recorded more than once. The loose attachment of epithelium calls for great care in the application of the tonometer. The association of the condition with myxedema has led to the idea that administration of thyroid might benefit, but he thought there had never been success from this treatment. Epithelial dystrophy has been described in association with myotonia atrophica, and this is further evidence that the state of the epithelium is bound up in the general metabolic state. Many drugs and physical means have been tried. One man scraped the cornea and applied iodine, but no improvement ensued.

Discussion. Mr. T. Harrison Butler said he did not think the silvery appearance at the back of the cornea to be so very rare if looked for, especially in milder cases of this condition. He would have thought the endothelial condition to be far commoner than the one now discussed. From the medico-legal point of view it is important to differentiate cases due to accident from those which Mr. Doggart had just described.

Dr. A. J. Ballantyne (Glasgow) said he had seen about thirty cases of the condition, and did not think its frequency was more than one case in 10,000 to 15,000. He had seen cases in workmen in which there was a definite association with injury, and they were of the same kind as the others.

Mr. Frank Juler said that this disease is probably more common than is usually thought. He asked what was considered to be the cause of the bronze appearance of the cornea. Graves thought it was a scattering of light from the reflection of minute protusions from Descemet's membrane.

Mr. Doggart did not think that there is any association of this condition with trauma, though he agreed that in association with trauma there could be epithelial changes, ranging from fine edema to a grossly bullous state. If there was an association of the condition under discussion with trauma, two thirds of the cases would not be so likely to be observed in women, as was found to be the case. This powdered-bronze appearance is something different from the ordinary pigment granules which result from the scattering of pigment in the iris in old people.

(Reported by H. Dickinson.)

COLORADO OPHTHALMOLOGICAL SOCIETY

November 16, 1935

Dr. Melville Black, presiding

Bilateral congenital nuclear cataracts, alternating strabismus, amblyopia ex anopsia

Dr. R. W. Danielson presented F. B., aged 9 years, who had been examined 16 months previously for poor vision and strabismus. He was also quite deaf and had a speech defect. There were bilateral nuclear cataracts large enough to fill the average-sized pupil entirely. The fundus seemed to be absolutely normal, as viewed through a dilated

pupil. The right eye converged about 40 degrees, the left eye usually fixating. The uncorrected vision was recorded as a questionable 0.2, each eye. Inasmuch as no skiascopy was possible and the child's answers were valueless no refraction test could be made.

A needling of the right lens was performed in August, 1934, and a discission of the capsular remains on September 30, 1935. A few days before presentation, although the pupillary area was now entirely free from any remains, the best vision obtainable with a +14.00 D. sphere was 0.1. The vision of the other eye with a +3.00 D. sphere was 0.4.

The case was presented because of the question whether the amblyopia of the needled eye was due to the original strabismus or to the occlusion of the vision by the lens remains. Would needling of the other eye be apt to result in better vision or might an occlusion amblyopia be produced there? Should the eyes be straightened before needling of the left eye was attempted?

Discussion. Drs. W. C. Bane, Melville Black, and Charles E. Walker were of the opinion that the amblyopia was due to the strabismus, and that needling of the left eye would result in better vision.

Dr. Charles E. Walker, Jr., expressed his belief that if the occluding lens material of the left eye were needled, vision in the right might be increased, and that possibly a final strong plus lens over each eye might cure the strabismus.

Dr. Whitney Porter pointed out that in congenital cataracts there were often other physical stigmata, as in this case, and that other oculo-cerebral defects might prevent perfect vision even though the surgery were successful.

Dr. G. L. Strader suggested a needling followed by washing out of the lens material within a few days.

Dr. E. R. Neeper advised leaving the eyes alone inasmuch as there was 0.4 vision.

Laceration of cornea

Dr. C. E. Sidwell presented a 7-year-old boy who six months previously had struck himself in the eye with a knife while digging in the gravel. Examination revealed a vertical wound of the cornea, with iris and vitreous presenting. Under general anesthesia the eye was cleansed, the iris and vitreous were pulled out slightly and cut off, and a conjunctival flap drawn over the cornea. Antitetanic serum was given as a prophylactic. Convalescence was normal. When presented, a tag of iris was adherent to the corneal wound and opaque lens capsule obscured the vision. The eye was slightly soft, but not painful. The case was presented for advice as to whether any further work should be done on the eye.

Discussion. Dr. Charles E. Walker urged cutting the anterior synechia and incising the capsular remains.

Dr. Melville Black thought that one could cut the adhesions with a de Wecker scissors through a keratome incision. He was of the opinion that such anterior synechiae predisposed to glaucoma.

Xerosislike conjunctival areas

Dr. C. A. Ringle presented P. D., a 50-year-old man who had had for 18 months a recurring white, bubbly, glistening area on the conjunctiva near the limbus, temporally. The eye was only slightly inflamed and gave but little discomfort. The man was in good health. He ate much sugar but was not known to be a diabetic. The peculiar feature about this area was that it was not a part of the conjunctiva as usually described under xerosis, but could be easily wiped off with a cotton applicator. Microscopic examination of a direct smear revealed many desquamated epithelial cells and diphtheroid bacilli. No pus corpuscles could be demonstrated.

Discussion. Dr. R. W. Danielson said that he recalled having read in the "Archives of Ophthalmology" (1929, June, p. 712) that diluted lemon juice was recommended as a collyrium in such cases.

Drs. Melville Black and Charles Walker recommended excision of the site of the recurring patch.

Dr. J. C. Strong said he had removed such an area in one case and that the growth had not recurred.

Dr. M. E. Marcove said that fat-soluble vitamins were indicated in the cure of such areas.

Progressive exophthalmos after removal of exophthalmic goiter

Dr. Charles E. Walker, Jr., presented F. Y., a 50-year-old barber, who had been examined on August 9, 1935, his chief complaint being double vision for four months and an increase in exophthalmos during the last three months. The patient gave a history of a thyroid operation in 1933, and again in 1934. There was an exophthalmos which measured 22 mm. for the right eye, and 26 mm. for the left eye, with the Jackson proptometer. The patient had a right hyperphoria of about 11 diopters. All of the signs of exophthalmos were present. On the first examination, a resistance was felt in the upper lateral portion of the left orbit. The examination was otherwise negative. The corrected vision of the right eye was 0.8, of the left eye 0.6.

The medical department reported a tentative diagnosis of neoplasm in the left orbit, hyperthyroidism of the post-thyroidal type, and a questionable intrathoracic neoplasm. Blood count was normal except for 6 percent eosinophilia. The urine and serology were negative. X-ray films of the skull and orbit failed to reveal any definite bone pathology. There was, however, cloudiness in the left frontal region and in the ethmoids, and a calcification in the region of the pineal gland. As to the chest, X-ray films showed marked fibrosis in the hilus and bronchial system, but no evidence of tumor invasion. On September 9, 1935, Dr. Swerdfeger removed nasal polyps and explored the ethmoids and mesial orbit. After the operation the exophthalmos did not recede and on October 11, 1935, Dr. W. A. Ohmart explored the left orbit, but no tumor was located.

By November 18, 1935, the exophthalmos had increased to 23 mm. in the right eye and to 28 mm. in the left eye. Dr. J. M. Shields suggested deep X-ray therapy to the orbit, which was given November 22, to November 27, 1935. On December 4, 1935, marked conjunctival injection was noted for the first time, but this has decreased. The vision has diminished to 0.4 O.D., and 0.2 O.S. No improvement in the hyperphoria has been noted.

Ralph W. Danielson,
Acting Recorder.

SAINT LOUIS OPHTHALMIC SOCIETY

October 25, 1935

Dr. Meyer Wiener, president

The carbohydrate matrix of the epithelial-cell inclusion in trachoma

Dr. C. E. Rice (by invitation) read a paper on this subject which was published in this Journal (January, 1936).

Discussion. Dr. Lawrence Post said that it seemed to him that anything that would throw light on the inclusion body was of great importance. He was greatly impressed with the thoroughness with which Dr. Rice had studied the possibility that glycogen was present in the inclusion. He wished to ask if the presence of glycogen would indicate that inclusion bodies were the products of cell degeneration rather than definite organisms.

Dr. L. A. Julianelle said that Dr. Rice's paper was most important. Much work had been done to check the cause of trachoma and to show what might not be the cause. Inclusion bodies had received a great deal of attention in attempts to ascertain whether they were the cause of trachoma or not. No one had ever endeavored to show the nature of the epithelial inclusion itself, until Dr. Rice in this paper had given the first suggestion of what it might be. The reaction to the acid was proof that the substance was glycogen. It was very good evidence that the inclusion body was an inanimate thing. The vital stains used by Dr. Rice had been used for some time. Living structures did not stain with these dyes. He had had occasion to use Dr. Rice's stain and found that it was very much to be preferred to the usual method for it considerably speeded up the time of staining.

Dr. Rice, in closing, said that he did

not see how the inclusion body could be a cellular reaction product and remain in evidence so long. He believed glycogen was produced by the cell. In fresh tissue it fused over quickly in the cell and if it were a product of cellular reaction it would fuse out quickly.

Historical notes

Dr. C. W. Tooker reviewed the history of the Saint Louis Ophthalmic Society.

A tumor of the hypophysis in an elderly woman

Dr. B. Y. Alvis read a paper on this subject.

Discussion. Dr. L. T. Furlow said that it was very unusual to see a pituitary tumor of any type in a patient of this age. He had been unable to find any one person who had reported a large series of pituitary tumors occurring in patients at various ages but he had seen two cases in patients between 50 and 60 years of age. The case reported by Dr. Alvis was in the oldest patient he had examined who had a pituitary tumor.

In the early days operations were performed through the nose and very much of the tissue was lost. Pituitary tumors were never operated on unless there were symptoms in the neighborhood of the tumor. The results of these operations have become much better.

H. Rommel Hildreth,
Editor.

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SYMPATHETIC OPHTHALMIA AFTER FILTRATION OPERATIONS

A recent short communication by Verhoeff (American Journal of Ophthalmology, 1936, volume 19, page 46) opens with the following statement: "Owing to the danger of sympathetic uveitis incident to iridotasis, in cases of chronic glaucoma I have with increasing frequency resorted to trephining."

This remark is made without amplification, and simply as introductory to description of a new conjunctival flap for trephine operations. The importance of such a remark lies in the influence its implication of fact may have concerning an operation which many ophthalmic surgeons have come to regard as extremely valuable, and as at least presenting no greater element of risk than accompanies other operations used for a like purpose.

It is generally understood that any injury, whether accidental or surgical, which opens the eyeball in the region of the iris or ciliary body carries with it an element of risk as to subsequent development of sympathetic ophthalmia. After skillful performance of intraocular operations such as those for removal of cataract or for relief of intraocular tension, the element of risk is statistically very remote, but it exists. In selecting a method for either of these purposes, the question whether such method involves undue risk of sympathetic ophthalmia is of great importance.

Few will doubt that the risk of sympathetic ophthalmia is in close proportion to the incidence of prolonged uveal inflammation. Iris prolapse occurring after cataract extraction has always been an unwelcome complication, leading not merely to delayed healing but also to the possibility of sympathetic disturbance. It was largely because of this experience that the proposal to incarcerate the iris in a limbal incision

for the cure of glaucoma was at first strongly criticized by many surgeons. They felt that the procedure was contrary to good surgical principle. But it is noteworthy that some prominent ophthalmologists who at first rejected iridencleisis (or iridotasis) on this ground were later numbered among its most enthusiastic advocates.

In the history of the trephine operation, consideration of uveal infection as a late complication has played a very important part. Thus, Wilmer's survey of the literature concerning almost 3,500 trephine operations showed late infection in 1.2 percent. On the other hand, the same author was able to find only 0.38 percent of cases of late infection among 517 iris-incarceration operations (including Borthen's iridotasis).

Gjessing's review of 122 cases in which iridencleisis was performed in the course of twenty years showed no case of late infection, and this author emphasizes the almost complete absence of such a complication in his experience. A similar impression was derived by Pillat from reëxamination of about one hundred cases after intervals of from one to seven years.

The question why there is less danger of late infection after iridencleisis than after trephining has been discussed by Holth. He points out that in his operation (iridencleisis) the fistula is placed farther from the limbus than is the trephine fistula, and therefore has a thicker conjunctival covering. He makes the interesting observation that Seidel's fluorescein test is much more frequently positive after trephining than after iridencleisis.

Olsson has just reported a case of sympathetic ophthalmia after iridencleisis (Acta Ophthalmologica, 1935, volume 13, page 61). His comprehensive review of the literature includes a number of the references here mentioned. He was able to find only one case (that of Herbert) in which sympathetic ophthalmia had been directly associated with iridencleisis performed for simple glaucoma. Pillat's case followed performance of this operation for glaucoma secondary to tuberculous cyclitis. Lundsgaard had done a sclerotomy. He subsequently excised and cauterized a resulting fistula, and this secondary operation was followed by sympathetic ophthalmia fourteen days later.

In 1930, Schönenberger gathered from the literature three cases of sympathetic ophthalmia following the trephine operation. One of these occurred shortly after the operation, one three years later, and the third five years later. To these three he added three more that had occurred in Vogt's clinic at Zürich. Two of them arose shortly after the operation, the third after two years. Schönenberger raises the question whether this complication of the trephine operation is really so rare as the literature would indicate; and of course the same question may be asked with regard to iridencleisis. Holst reported in 1934 (Acta Ophthalmologica, 1934, volume 12, page 348) a case which had occurred in the Oslo clinic in 1931, after iridencleisis.

The experience of any single case of sympathetic ophthalmia is so tragic that the surgeon involved is likely to have misgivings as to his operative method. On the other hand, the most faultless technique does not seem to offer safety against this complication. From the evidence available it does not appear that there is any greater risk of this complication after iridencleisis than after trephining.

W. H. Crisp.

DINITROPHENOL CATARACT

Among many names supposed to indicate the causation of cataract this one must have a place. It is less than a year since this variety was first mentioned in the literature, but so many cases of this form have been recognized that there can be no doubt as to its causation, nor as to its importance.

When Tainter, Stockton, and Cutting presented their paper upon "Dinitrophenol in the treatment of obesity," last year, at the meeting of the American Medical Association (Section on Pharmacology), it was based upon 170 cases. No mention, however, was made of cataract as a possible effect of dinitrophenol. They had conducted most careful investigations to prove the safe-

ty of the treatment. Only, in closing the discussion of the paper, Tainter mentioned that in one patient cataract developed six months after the use of the drug had been discontinued.

For three years dinitrophenol had an important place in the medical literature of America and Europe, apparently without any suggestion that it might cause cataract. Its use had been followed, in single cases, by abortion and by death; also, in a large number of cases, by peripheral neuritis. The investigations by experiment and careful case records had shown that it did not cause leucopenia, or other harmful effects on the blood cells, blood pressure, or pulse rate. In the animals used for experiment it caused no pathological changes in the liver. In medicinal doses it sometimes caused a pruritic skin eruption that subsided when the use of the drug was discontinued.

But beginning in July, 1935, cases of cataract following the use of dinitrophenol began to be reported from different cities, ranging from Boston to San Francisco; and in six months the number of reported cases has risen to more than 100. Symptoms not to be regarded as toxic, but as normal effects of a stimulant to metabolism, are a sensation of warmth, increased heat production, and perspiration. This is attended with general dehydration. These facts that have recently come to the knowledge of ophthalmologists bring them certain responsibilities and duties.

The Colorado Ophthalmological Society appointed a committee to bring the danger of this form of cataract to the attention of the medical profession, and this was done through "Colorado Medicine" (February, 1936, p. 83). The warning stated, "The danger of blindness from this drug has been so conclusively demonstrated that it is absolutely improper for any physician to recommend dinitrophenol or any preparation containing it."

Dinitrophenol has furnished a new point of view and approach for study of the causes of cataract. It is conceivable that this drug breaks through the protective function of the lens capsule to preserve the transparency of the crystalline lens. It is possible that it poisons the subcapsular epithelium, the tissue on which the growth and nutrition of the lens most directly depends. Certainly, the opacities caused by dinitrophenol have a special distribution in the lens substance; and they can increase very rapidly, even after the ingestion of dinitrophenol has been completely stopped.

Perhaps the important effect of this drug is the dehydration it produces. Senile cataract seems often to depend on the deficiency of water taken into the system by elderly people. In such cases, the free drinking of water stops the increase of opacity and, in some cases, is followed by definite clearing of the lens. The most definite and important advice we can give for the prevention of dinitrophenol cataract is that, if the drug is taken in even the smallest doses, water must be taken very freely. Whether this will check such cataract after it has started is uncertain. Cataract has long been known as a cause of blindness. Our new point of view regarding it may help to solve the problems of its prevention.

Edward Jackson.

OPHTHALMOSCOPY IN GENERAL DIAGNOSIS

Teachers of ophthalmology in the United States have evidently failed to evaluate properly and emphasize for undergraduate medical students the importance of ophthalmoscopy in general diagnosis. It is lamentable that an organization such as the National Board of Medical Examiners fails to realize and take cognizance of the fact that an examination of the ocular fundi should be a routine procedure in physical examination. The National Board issues a pamphlet to examiners entitled "Suggestions for conducting examination in Part III," in which, under the caption "Eye, ear, nose and throat," on page 10, it is stated, "Each candidate should be examined for thirty minutes on each of these subjects. He is to be given cases for diagnosis, bearing in mind at all times that the Board is only concerned with the amount of knowl-

edge in these specialties which might reasonably be expected of a well-trained physician. The candidate should not be required to use the ophthalmoscope." One wonders why the physician cannot "reasonably" be expected to recognize common nerve-head and retinal disturbances indicative of general diseases and also what really constitutes a "well-trained physician." One might even wish to know what a really well-trained physician thinks of such an attitude. Perhaps, since only the outside of the eye is to be examined, the candidate in internal medicine, in an analogous manner, should not attempt to determine by palpation and auscultation what may be amiss inside the chest and abdomen but should only make observations of the external aspects of these parts, and candidates in the otolaryngology examination should not be expected to look inside the nose and throat!

It is at least commendable that all physicians do not ignore the importance of ophthalmoscopy. Foster Kennedy in Cecil's "Textbook of medicine" states: "The constant use of the ophthalmoscope is essential in neurological medicine and almost essential in all branches of medicine. The instrument is more indispensable than a stethoscope."

Like one who has never had electric lights and does not miss them, most physicians get along without ophthalmoscopy; they have not been shown and convinced of its importance in diagnosis and consequently do not miss it. But it is a certainty that some diagnoses are missed for lack of such examinations.

In the diagnosis of intracranial lesions the ophthalmoscope is invaluable and indispensable; it is simple to understand that this is true when it is realized that no less than 80 percent of brain tumors produce choked discs. Furthermore, in the study of the state of the vascular system, e.g., in diseases such as arteriolar and arteriosclerosis, an eyeground examination in which the actual changes in the vessels may be visualized is of greatest importance. Mention need only be made of diabetes, nephritis, blood dyscrasiae and other diseases in which the fundi often show more or less characteristic changes.

It is the aim of every physician to make an accurate diagnosis and institute proper treatment in each case; consequently, every available means should be used to that end and every physician should be qualified to utilize the common, valuable, diagnostic instruments. Certainly the ophthalmoscope is one such instrument. The student and physician should be taught the use of this instrument and the recognition of fundus changes in the more common diseases. It is a duty as yet unfulfilled in many institutions of medical learning. Let us, as physicians and not as specialists in ophthalmology, look to our teaching! C. S. O'Brien.

BOOK NOTICES

Bulletin et Mémoires de la Société Française d'Ophtalmologie, 1935. xcv + 491 pages, illustrated, price not stated. Paris, Masson et Cie, 1935.

This volume is a fit addition to the previous valuable reports of this famous society. It contains a large number of original articles, many by distinguished ophthalmologists. Even a partial list of the contributors indicates the importance of this four-day session in May, 1935. Among those well known to American ophthalmologists are Arruga, Bailliart, Coppez, Cuénod, Dupuy-Dutemps, Haas, Jeandelize, Kalt, Koby, Lopez Enriquez, Polack, Redslob, Rochon-Duvigneaud, Roulet, de Saint-Martin, Sourdille, Terson, Weekers, and Worms.

It is obviously impossible to do justice in a brief review to the more than fifty papers presented. In many cases the discussions are of even more importance than the papers. The reviewer is apt to regard those subjects in which he is especially interested as of particular interest to others, hence he found most valuable Arruga's discussion of intracapsular extraction, Cuénod and Nataf's paper on the treatment of trachoma with the accompanying discussion, and several on detachment of the retina.

Undoubtedly many of these papers will appear in current ophthalmic pub-

lications and be abstracted in this Journal. Lawrence T. Post.

Plates for testing color vision. By C. G. Boström. 16 plates, price not stated. Published by Kifa, Stockholm, Sweden.

This series of sixteen plates for testing color vision is an elaboration of a set devised by Dr. G. Göthlin, Professor of Physiology in the University of Uppsala, in 1915, but never made available to the public. Professor Göthlin and Mr. G. Tholander, the lithographer to the Royal Academy of Sciences in Stockholm, collaborated with the author in the preparation of the series now published.

The test is very similar to that of Ishihara. The author does not suggest that the plates add anything to the Ishihara and Stilling plates, but are designed to provide a test supplementary to that of Ishihara and have been accepted by the Royal Swedish Board of Health to be used in conjunction with that test. Their composition is as follows:

Two simulator plates, on which the number can be read by anyone with 0.3 vision or better. Ten plates, all of which can be deciphered by persons with normal color vision. Four plates in which no figures can be read.

By the nature of the colors used in the dots, a rough estimate of the type of color blindness can be made.

In the reviewer's opinion the set is a good one and would serve as an excellent supplement to the Ishihara and Stilling pseudoisochromatic plates.

Lawrence T. Post.

CORRESPONDENCE

Dosage of atropine

March 26, 1936.

The Editor,
American Journal of Ophthalmology:

I have just read with interest an article appearing on page 245 of the March, 1936, issue of the Journal, the title of which is, "Hyperpyrexia following the use of atropine in the eyes of children," by Dr. Wilber Swett.

In this article he makes the statement that one drop of 0.5 percent atropine solution is equivalent to 1/20 gr.; one drop of 1 percent solution is equivalent to 1/10 gr.; three drops of 0.5 percent solution is equivalent to 1/6 gr.; three drops of 1 percent solution is equivalent to 1/4 gr. These are not correct in that they are in reality 1/10 this strength. That is to say, one drop of 0.5 percent solution is equivalent to 1/200 gr.; one drop of 1 percent solution is equivalent to 1/100 gr. etc.

The reason I feel that this should be corrected is that someone may make his solutions himself, and thereby be using 10 percent solution instead of 1 percent, if he follows the examples in the article.

Yours very truly,

(signed) W. O. Martin, Jr.

ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is only mentioned in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

1. General methods of diagnosis
2. Therapeutics and operations
3. Physiologic optics, refraction, and color vision
4. Ocular movements
5. Conjunctiva
6. Cornea and sclera
7. Uveal tract, sympathetic disease, and aqueous humor
8. Glaucoma and ocular tension
9. Crystalline lens
10. Retina and vitreous
11. Optic nerve and toxic amblyopias
12. Visual tracts and centers
13. Eyeball and orbit
14. Eyelids and lacrimal apparatus
15. Tumors
16. Injuries
17. Systemic diseases and parasites
18. Hygiene, sociology, education, history
19. Anatomy, embryology, and comparative ophthalmology

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5. CONJUNCTIVA

Mohamed, I. A. **A bacteriological study of gonococcal ophthalmia.** Giza Mem. Ophth. Lab., 9th annual rept., 1934, pp. 111-132.

The author set out to determine the dates of disappearance of gonococci from the conjunctiva after an attack of purulent ophthalmia, using Gram's and Giemsa's stains. The discharge usually ceased 2 or 3 days before the conjunctival smear was negative for gonococci. Smears of conjunctival secretion became negative or scantily positive long before Giemsa-stained epithelial scraping showed any tendency to become negative. No case could be kept under observation longer than one month. Right up to the last day of observation epithelial scrapings showed some cells heavily infected with gonococci. Biologic and serologic characteristics were studied, and complex tables are presented. The ophthalmic gonococcus is more readily isolated and subcultured than the urethral strains. Gonococci are classified into two main groups according to their antigenic complexity.

Lawrence G. Dunlap.

Paparcone, E. **Treatment of trachoma with sodium taurocholate.** Rev. Internat. du Trachome, 1935, v. 12, Oct., pp. 202-204.

In 1914 the author reported treatment of trachoma with sodium oleate. He was interested in its action on the inclusion bodies, which he felt were organic formations. He found that protozoa were killed by saponin, soap, and bile. P. J. Leinfelder.

Paradoksov, L. E. **Acute conjunctivitis in Central Asia.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 4, p. 467.

Bacteriologic studies in 1,000 cases lead the author to conclude that the acute conjunctivitis prevalent during the summer and autumn months in Central Asia is an infectious disease, caused in the majority of cases by the Koch-Weeks bacillus; that the high temperature, the winds, the bright sunlight, and the dust present favorable conditions for development of this conjunctivitis; and that lack of sanitation and popular ignorance favor spread of the infection. There is no basis for relating the infection to the cotton industry, and the best prophylactic measures are improvements in sanitary and educational conditions. Ray K. Daily.

Pashkovskii, V. M. **The action of carotin in external diseases of the eye.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 4, p. 500.

The author finds carotin locally superior to all other therapeutic agents in relieving the subjective symptoms of electric and chemical conjunctivitis.

Ray K. Daily.

Rameev, P. C. **Swimming pool conjunctivitis.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 4, p. 471.

The outstanding features of this infection are the mild subjective symptoms with severe objective phenomena, absence of corneal complications, scanty secretion, and resistance to treatment. Ray K. Daily.

Stewart, F. H. **Experiments in the pathology of trachoma.** Giza Mem. Ophth. Lab., 9th annual Rept., 1934, pp. 95-110.

The author describes attempted filtration of trachoma virus through Gradocol membranes of a.p.d. 0.6 to 0.7 microns, and concludes that there is no clear proof that trachoma virus can pass. Free elementary granules and free initial bodies are discussed. In Egypt blennorrhea neonatorum is unknown in the first two months of life, but ultimately 90 to 99 percent of Egyptians develop trachoma.

Lawrence G. Dunlap.

Strebel, J. **Autumnal floral allergic conjunctivitis.** Klin. M. f. Augenh., 1936, v. 96, Jan., p. 105.

A man of 43 years became affected with intense itching conjunctivitis as soon as he came in contact with fresh autumnal flowers (such as dahlias, asters, and especially chrysanthemums). The glassy filaments found in the lower fornices contained numerous eosinophiles. The best local therapy was instillation of ten percent adrenalin solution with one percent of novocain, or iced applications. C. Zimmermann.

6. CORNEA AND SCLERA

Ammann, E. **Herpes zoster ophthalmicus traumaticus.** Klin. M. f. Augenh., 1935, v. 95, Dec., p. 793.

The left eye of a farmer aged 27 years was hit by the tail of a cow, and developed ciliary injection. On the sixth day herpes zoster ophthalmicus developed. This case, and nine cases reviewed from the literature, show that traumatism may cause herpes zoster ophthalmicus as well as herpes corneae simplex. C. Zimmermann.

Feldman, P. B. **Cases of corneal transplantation under village conditions, with clearing of the opacity around the transplant resected without a trephine.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 4, p. 483.

Without the necessary equipment and under primitive surgical conditions the author did a corneal transplantation on one eye of a nineteen year-old girl, both of whose eyes had been ruined in childhood by smallpox. A semitransparent segment of the cornea between the transplant and the upper limbus became transparent after the operation. The author attributes this regeneration in an old scar to the vitalizing effect of the newly formed blood vessels on the absorption of lipoid deposits. He believes that corneal transplantation can and should be done outside of large ophthalmologic centers. (Illustrations.)

Ray K. Daily.

Saper, I. M. **Treatment of serpiginous ulcer of the cornea.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 5, p. 678.

The author uses instillations of optochin and cauterization with twenty-percent zinc sulphate. Where bacteriologic studies are not available this treatment is directed against the two most commonly guilty organisms—the pneumococcus and the diplobacillus.

Ray K. Daily.

Sicharulidze, I. A. **Symptoms and therapy of malarial keratitis.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 5, p. 640.

Herpetic keratitis occurs most frequently but parenchymatous and deep keratitis are seen. Tertian and quotidian malaria have a tendency to involve the cornea, while the tropical form is prone to involve the choroid, retina, and optic nerve. The course of the keratitis is more severe in inhabitants of malarial regions, whose resistance is usually at a low ebb. Therapeutically one-percent solution of quinine and morphine locally is used extensively, and irradiation with the Birch-Hirschfeld lamp is effective. Ray K. Daily.

Smoljaninov, L. I. **Ocular disease caused by latent infection.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 4, p. 481.

Parenchymatous keratitis developed in a quiet eye after iridectomy done to check the progress of a cicatricial staphyloma. The interesting feature of the case was the intense Pirquet reaction, and the astonishing rapidity with which the case got well after the cutaneous dose of tuberculin.

Ray K. Daily.

Starodubtzeva, A. I. **Gravidan in the therapy of scleritis.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 5, p. 670.

Eighteen cases of nontuberculous scleritis and episcleritis demonstrated the value of gravidan in shortening the course of the disease, relieving pain, and abating the inflammatory phenomena even in old cases.

Ray K. Daily.

Sterenberg, M. A. **Partial corneal transplantation.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 5, p. 67.

This report of four cases leads to the conclusion that the technique is simple and should be mastered by every ophthalmologist. Ray K. Daily.

7. UVEAL TRACT, SYMPATHETIC DISEASE, AND AQUEOUS HUMOR

Benstein, I. I. **Surgical intervention in persistent pupillary membrane.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 5, p. 662.

To discourage surgical intervention in persistent pupillary membrane the author reports a case of unusually dense bilateral membrane, in which the attempt to remove it in one eye was followed by development of cataract.

Ray K. Daily.

Coppez, H. **Two cases of Adie's syndrome.** Bull. Soc. Belge d'Opht., 1935, no. 70, p. 60.

The syndrome first described by Adie in 1931 is essentially as follows: (1) Myotonic pupil simulating at first sight the Argyll Robertson pupil. (2) Absent tendon reflexes, particularly marked in the lower extremities. (3) Absence of pathologic reactions of blood or cerebrospinal fluid. Most subjects afflicted with this syndrome were diagnosed as tabetic and treated as such. Other reports designated the disease as nonsyphilitic Argyll Robertson, internal ophthalmoplegia, pupillary rigidity, iridoplegia, and so on. The differential signs are: Adie: unilateral, convergence reflex slow, mydriasis, complete dilatation by mydriatics; Argyll Robertson: bilateral, exaggerated, miosis, incomplete dilatation by mydriatics. Syphilis is not the cause. Coppez reports two cases personally observed, previously diagnosed as probable incipient tabes, but later recognized as cases of Adie's syndrome. (Bibliography.) Jerome B. Thomas.

Kasas, I. I. **From the therapy of diseases caused by grippe to the prophylaxis of sympathetic ophthalmia.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 4, p. 496.

The author found urotropin intravenously very effective in treatment of herpetic keratitis following malaria or grippe. On the assumption that sympathetic ophthalmia is caused by development within the eyeball of a virus similar to that of herpes, he uses urotropin intravenously to prevent sympathetic ophthalmia after perforating ocular injuries. Ray K. Daily.

Poos, Fr. **Are the centers for dilatation and contraction of the pupil stimulable by carbon dioxide in the blood?** Klin. M. f. Augenh., 1936, v. 95, Jan., p. 45. (Ill.)

Poos repeated the experiments of Wieland and Schön and finds improbable their conclusion that the centers for pupillary movements, like the respiratory center, are stimulated or paralyzed by fluctuations of carbon dioxide tension within physiologic limits. The miosis under morphine and during digestion and sleep cannot be explained by such theoretically assumed connections. C. Zimmermann.

Samojloff, A., and Tihomirova, A. **The diagnosis and specific treatment of tuberculous choroiditis.** Ann. d'Ocul., 1935, v. 172, Dec., pp. 993-1003.

In tuberculous choroidal lesions, subcutaneous injection of minute doses of tuberculin produces a focal reaction, varying in type and intensity with the amount of tuberculin injected. It is quite specific in character and may be used as a diagnostic measure. From 0.2 to 0.5 c.c. of a 1 to 10,000,000 solution of Koch's old tuberculin is usually sufficient for a diagnostic reaction. After the minimal effective dose there is sudden appearance of pigment in areas of choroiditis not previously pigmented. Rings of pigment appear also in the periphery of the lesions. A larger dose produces hyperemia of the entire choroid, while a still larger dose may result in destructive retinal hemorrhage. In cases in which tuberculous choroiditis is suspected, the dosage of tuberculin should be cautiously increased until a reaction is obtained. Thirty-three cases reported gave focal reactions. They were treated with tuberculin with good results. But tuberculin is of even greater value for diagnosis than for treatment. John C. Long.

Strebel, J. **Recurring iritis in progressive spondylarthritis ankylopoietica. Improved by resection of the epithelial bodies.** Klin. M. f. Augenh., 1935, v. 95, Dec., p. 786.

The patient had contracted gonorrhea in 1916 and since 1917 had suffered from typical spondylarthritis ankylopoietica and relapsing iritis of both eyes with exudates in the vitreous. He had studied the works of Leriche of Strassburg and himself demanded resection of the epithelial bodies. The therapeutic result started from the second year after this, had endured for three years, and was improving every year.

C. Zimmermann.

8. GLAUCOMA AND OCULAR TENSION

Barkan, O., Boyle, S. F., and Maisler, S. **On the genesis of glaucoma. An improved method based on slitlamp microscopy of the angle of the anterior chamber.** Amer. Jour. Ophth., 1936, v. 19, March, pp. 209-215; also Trans. Pacific Coast Oto-Ophth. Soc., 1935, 23rd annual meeting, p. 135.

Churgina, E. A., and Nikolajeva, M. C. **The significance of the dispersion of pigment epithelium in the early diagnosis of glaucoma.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 4, p. 448.

The author checked 52 eyes with the Seidel test and with a slitlamp study of the iris epithelium. The tabulated report fails to confirm Koeppe's claim that dispersion of the epithelium of the iris is diagnostic of early glaucoma.

Ray K. Daily.

Tzikulenko, K. I. **Antiglaucomatous operations in trachomatous areas.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 5, p. 581.

In Turkmenistan chronic simple glaucoma is very prevalent and is often found in trachomatous eyes. To escape opening the eyeball through infected conjunctiva, the author exposes the lower temporal quadrant of the sclera through an external skin incision. In this manner he has done, with satisfactory results, posterior sclerotomies and also scleral trephining with cyclodialysis. Ray K. Daily.

Wilenkin, M. **Action of doryl on intraocular pressure and pupillary diameter.** Klin. M. f. Augenh., 1936, v. 96, Jan., p. 84.

Nineteen glaucomatous and nine normal persons were examined after instillation of five drops of a 0.75 percent watery solution of doryl within five minutes in one eye, the other serving for control. Intraocular tension first declined for one hour and then rose, almost as after pilocarpin. The maximal miosis lasted in eight cases for six hours, and in no case less than twenty minutes. In some cases doryl caused slight injection for from one to two hours. This new miotic may be used when pilocarpin is not tolerated or is no longer effective.

C. Zimmermann.

9. CRYSTALLINE LENS

Alcala Lopez, Antonio. **Posterior lenticonus and false lenticonus.** Arch. de Oft. Hisp.-Amer., 1935, v. 35, Oct., pp. 505-514.

The author reviews the literature of posterior and false lenticonus. To retinoscopy, an eleven-year-old boy presented symmetrically in both lenses an area of clearer refraction than the rest of the lens. Slitlamp examination failed to show any lens deformity. Therefore, the case belongs to the group called false lenticonus. The author is inclined to believe that the area of clearer refraction might have been produced by some cells from the anterior epithelium which had been included in the lens fibers originating in the posterior epithelial cells. There was also a possibility of formation of hyperkeratic areas, as found in some types of skin epithelioma. (One illustration, bibliography.) R. Castroviejo.

Arjona, J. **Genealogy of a family with juvenile cataract and of others with retinitis pigmentosa.** Arch. de Oft. Hisp.-Amer., 1935, v. 35, Oct., pp. 551-556.

The author reports a family of four generations, of 35 individuals, of whom 26 had cataract. The individuals of the fourth generation observed by the author had cataract of the juvenile type. Two other families were affected with retinitis pigmentosa. The first had four generations and 33 individuals, of whom 19 were affected. The second had four generations and 10 individuals, of whom 8 were affected by the disease. In the case of the family with cataracts the author is inclined to believe that some chemical factor was responsible for development of disease, being transmissible by inheritance. The chemical factor may be related to disturbances of glands of internal secretion. As to retinitis pigmentosa, the author follows the opinion of Gowers, who thinks the disease is produced by a process of abiotrophy beginning in the neuroepithelium. R. Castroviejo.

Lagrange, Henri. **Remarks on one hundred and fifty systematic attempts at intracapsular extraction.** Ann d'Ocul., 1935, v. 172, Dec., pp. 1003-1014.

Three different methods were used: extraction with iridectomy after corneal section with the Graefe knife, extraction with iridectomy after corneal section with the keratome, and simple extraction after a keratome incision. The operation of choice is as follows: Anesthesia and mydriasis are produced by instilling every two minutes, alternately, two drops of five percent cocaine solution and two drops of epinephrin 1 to 1000 until each drug has been instilled ten times (a total of forty minutes). A large keratome incision is made, beginning in the conjunctiva above the limbus. The lens is grasped with Arruga forceps and extracted. Several drops of 2-percent eserin solution are instilled to produce miosis. No sutures are used and no iridectomy is done. The operative results show remarkably few postoperative complications. (9 illustrations.)

John C. Long.

McCool, J. L. **Lid control sutures in the intracapsular operation for senile cataract.** South. Med. Jour., 1935, v. 28, March, p. 245.

The technique of akinesia, deep orbital injections and placing of superior rectus sutures is given by the author, who regards these preliminary procedures as essential in all intraocular operations. He uses multiple sutures for controlling the lids in preference to specula or lid hooks. The method of insertion of these sutures and their control is described as well as his method of intracapsular cataract extraction.

Edna M. Reynolds.

Meksina, F. M. **The structure and regression of the embryonal perilenticular capsule.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 5, p. 666.

This is the 28th case of persistent perilenticular capsule. The eye was enucleated upon a diagnosis of glioma, and the true condition was shown by histopathologic examination. (Illustrations.) Ray K. Daily.

Rohrschneider, W. **Traumatic detachment of the lamella of the lens capsule during iridectomy.** Klin. M. f. Augenh., 1936, v. 96, Jan., p. 31. (Ill.)

Two cases are reported, and others are quoted from the literature, to show that detachment of the lamella of the anterior capsule of the lens not only arises from heat in the cataract of blacksmiths, iron founders, and glass blowers, but may also occur rarely in chronic iritis, from external influences. In the author's two cases the detachment was due to iridectomy or a shrinking process within the eye, and protruded as a distinct lamella into the anterior chamber. C. Zimmermann.

Tichomirov, P. E. **Arachnodactyly and ectopia lentis.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 5, p. 591.

Of three cases, two also had retinal detachment. The literature is reviewed. (Illustrations.) Ray K. Daily.

Vittadini, A. **Contribution to the study of astigmatism in patients operated on for cataract.** Arch. di Ottal., 1935, v. 42, Sept.-Oct., p. 303.

In 85 cases several operative techniques were employed. Variations from 0.50 to 16 D. were found. The astigmatism was greatest immediately after operation, and diminished up to about one year after operation, being usually constant thereafter. The type of operation had no bearing on the amount of astigmatism, but disappearance of the astigmatism was affected by the rapidity of cicatrization. H. D. Scarney.

10. RETINA AND VITREOUS

Arjona, J. **Genealogy of a family with juvenile cataracts and others with retinitis pigmentosa.** Arch. de Oft. Hisp.-Amer., 1935, v. 35, Oct., pp. 551-556. (See Section 9, Crystalline lens.)

Arruga. H. **Present state of treatment of retinal detachment.** Arch. de Oft. Hisp.-Amer., 1935, v. 35, Oct., pp. 514-533. (See Amer. Jour. Ophth., 1935, v. 18, Sept., p. 878.)

Bartels, M. **Retinal changes, tears, detachment.** Klin. M. f. Augenh., 1936, v. 96, Jan., p. 1.

Two cases are described in which ruptures at the ora were overbridged by a firm gray membrane without vessels. The author attributes this to cleavage of the retina with tear of the inner layer. C. Zimmermann.

Casini, F. **Concerning pigmentary retinitis and avitaminosis (Laurence-Biedl syndrome).** Arch. di Ottal., 1935, v. 42, Nov., p. 409.

Three cases of retinitis pigmentosa associated with various malformations of polydactyly, xeroderma pigmentosum, and meningocele are described. Treatment with ascorbic acid gave no improvement. H. D. Scarney.

Desvignes, Pierre. **Functional examination of cases of retinal detachment considered cured by operation.** Ann. d'Ocul., 1935, v. 172, Dec., pp. 977-993.

Retinal function was studied in fifteen cases after successful operations for retinal detachment. Studies of dark adaptation, central and peripheral color perception, visual fields, angioscotomas, tension, and retinal arterial pressure were made. The findings in seven cases are recorded in detail. The power of dark adaptation was greatly reduced. Visual fields for white were nearly normal except where chorioretinal scars were extensive. The fields for blue were greatly reduced in all cases. The blind spot of Mariotte was greatly enlarged as determined by Evans's method. Central visual acuity remained low in a number of cases. Hypotension persisted as a rule. Some of the changes in retinal function probably occur before detachment actually takes place, so that perhaps an impending detachment might be anticipated. John C. Long.

Lloyd, R. I. **Hereditary macular degeneration.** Amer. Jour. Ophth., 1936, v. 19, March, pp. 216-221; also Trans. Amer. Ophth. Soc., 1935, v. 33, p. 146.

Löwenstein, Arnold. **Fat embolism as cause of traumatic retinal angiopathy (Purtscher).** Klin. M. f. Augenh., 1936, v. 96, Jan., p. 62. (Ill.)

The clinical picture may be essentially that of fat embolism. Bone frac-

tures play an important part, as illustrated by reports of two cases. A third case showed the ophthalmoscopic picture after an operation in soft parts without bone lesion. Proof by Urbanek of fat in vessels of retina and choroid determines the etiology of the retinal affection. The white foci in fat embolism are not consequences of direct obstruction but may be due, as in diabetic retinitis, to nutritional disturbances of the vessel walls. Cholin therapy by mouth, with inhalations of amyl nitrite, is recommended especially for cases with macular lesions.

C. Zimmermann.

Ridley, Harold. **Cystic retinal detachments.** Brit. Jour. Ophth., 1936, v. 20, Feb., p. 65.

In the type of detachment discussed there is usually a history of clouding of some part of the nasal field with unimpaired central vision. The sensation of billowy movement is absent to examination. The cysts are globular and translucent. Four cases are reported in patients past middle life. In some eyes two cysts were observed. All were cured by diathermy operation.

D. F. Harbridge.

Schmelzer, Hans. **Bilateral retinal detachment with symmetric tears at the ora in two young brothers, not myopic.** Klin. M. f. Augenh., 1936, v. 96, Jan., p. 19. (Ill.)

Two healthy brothers, aged 25 and 32 years, each presented in both eyes flat detachment of the lower half of the retina, with entirely symmetric tears at the ora on the lower temporal side. A congenital disturbance of development was assumed.

C. Zimmermann.

Schupfer, Francesco. **The importance of changed action of the midbrain for the pathogenesis of retinitis pigmentosa.** Klin. M. f. Augenh., 1936, v. 96, Jan., p. 91.

Schupfer discusses the different theories and tabulates examinations of ten cases without solving the problem.

C. Zimmermann.

Shivarova, E. D. **Juvenile retinal periphlebitis.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 4, p. 537.

A case with positive Mantoux reaction and enlargement of the peribronchial glands is cited in support of the tuberculous etiology of the disease, and against Marchesani's theory that the disease is a local manifestation of general vasopathy. Ray K. Daily.

Suganuma, Sadaaki. **Studies on blood pressure in the central retinal artery. Blood pressure in the central retinal artery in health and its relation to general blood pressure.** Klin. M. f. Augenh., 1936, v. 96, Jan., p. 74.

Measurements of blood pressure of the central retinal arteries of 65 healthy men with normal circulatory systems, with the author's new ophthalmodynamometer, showed systolic 59.7 mm. Hg. diastolic 38.5, with general systolic blood pressure 120.4 mm. Hg. The ratio of the blood pressure in the central retinal artery to general blood pressure varied between 44 and 55 to 100; that is, there was no close relation between the two values. The blood pressure in the central retinal artery, like the general, rises with age. Under normal conditions it may differ in the two eyes. In normal ocular tension no close relation exists between this and the blood pressure in the central retinal artery. C. Zimmermann.

Szily, A., and Machemer, H. **The importance of cathode and anode in electrolytic treatment of retinal detachment.** Klin. M. f. Augenh., 1936, v. 96, Jan., p. 36. (Ill.)

The comparative experiments of the authors revealed no essentially different effects as between anode and cathode. As a rule the anode is to be preferred, because it produces less gas.

C. Zimmermann.

Velhagen, Karl, junior. **Remarks on juvenile detachment of the retina and the importance of slight traumas.** Klin. M. f. Augenh., 1936, v. 95, Jan., p. 26.

Whether heredity or tuberculosis or a third unknown factor plays a part in

juvenile detachment of the retina, this must be distinguished from the senile and myopic types, because its clinical character is so different, although other detachments in young myopes and from injury in the young do not differ from those of older persons. Trauma as cause is more probable when fewer endogenous factors are found, and less probable when more endogenous factors are found.

C. Zimmermann.

Vogt, Alfred. **Cystoid degeneration as cause of large spontaneous ruptures at the ora serrata, and their healing by catholysis.** Klin. M. f. Augenh., 1936, v. 96, Jan., p. 10.

It has been proved that cystoid degeneration may lead to holes and tears of the retina and large ruptures at the ora. Four cases are reported with perfectly clear vitreous. According to Vogt's experience rubbing an eye with peripheral cystic degeneration of the retina may be sufficient to produce a tear. After Vogt's experimental removal of the vitreous from equatorial sections of fresh eyes of pigs and cattle and also human beings, the free ends of the retina were always proverted, never retroverted, in consequence of the elastic tendency of the retina. This physical force will help to keep the tear open and promote the detachment. Thus the doctrine of the genesis of spontaneous detachment of the retina by traction from the vitreous has been disproved. C. Zimmermann.

Vogt, Alfred. **Healing by catholysis of retinal detachment caused by hole at the macula.** Klin. M. f. Augenh., 1936, v. 96, Jan., p. 15.

Vogt considers his cathode electrolysis as the most conservative method. It has diagnostic value during operation, orientation being facilitated through the development of a white foam. In two cases of detachment from cystoid macular holes, satisfactory vision was regained by this method.

C. Zimmermann.

Walsh, F. B., and Sloan, L. L. **Idiopathic flat detachment of the macula.** Amer. Jour. Ophth., 1936, v. 19, March, pp. 195-208.

11. OPTIC NERVE AND TOXIC AMBLYOPIAS

Balada, M., and Malbran, J. **Surgical optic atrophies.** Arch. de Oft. de Buenos Aires, 1935, v. 10, Nov.-Dec., p. 777.

The term optic atrophy should be reserved for those with evidence of nerve fiber degeneration. Direct ophthalmoscopy with a Gullstrand, quantitative perimetry, and study of pupillary reactions are necessary for correct diagnosis. Orbital tumors are more likely to produce papilledema than atrophy, while tumors involving the chiasm produce simple atrophy more often than edema. Tumors of the third ventricle are frequent but give rise to papilledema rather than atrophy. Arachnoiditis is next in frequency to adenomas of the hypophysis as a cause of atrophy. Quantitative perimetry followed by ventriculography is of fundamental importance in differential diagnosis. Traumatic cases exhibit irregular field defects, and involvement may be bilateral if the chiasm is stretched or ruptured. Various other details concerning chiasmal lesions are discussed.

Ventriculography with iodized oil by the method of Balada enables one to differentiate five types of involvement of the third ventricle and to establish the direction of growth of neoplasms of the hypophyseal region; discloses involvement of the frontal pole of the lateral ventricle in frontal lobe tumors; and by negative ventriculograms helps in the diagnosis of arachnoiditis. Radiograms are usually of value only when they indicate general enlargement of the sella. Calcification above the sella argues for craniopharyngioma. Seventy cases of surgical optic atrophy are tabulated including 44 due to neoplasm and 23 to arachnoiditis, and 2 traumatic, one with skull fracture and one without. A differential diagnostic table of the nonsurgical and surgical optic atrophies accompanies the paper, as well as illustrations of the five types of ventriculogram. M. Davidson.

Tiscornia, A. Ibanez Puiggari, M. and von Grolman, G. **Inflammatory retrobulbar neuritis. Present-day views.** Arch. de Oft. de Buenos Aires, 1935, v. 10, Nov.-Dec., p. 824.

The subject is reviewed historically. Behr's pathologic classification into axial, perineuritic, interstitial, peripheral, and transverse is considered the most adequate. While temporal pallor must be diagnosed with caution and based on its sector-like character, its avascularity and velvety texture, and the presence of white porcelain-colored concretions, it is pointed out (following Rönne) that a visual acuity of 20/40 is possible with only one-fourth of the receptors required for a visual acuity of 20/20; so that in a person who has had visual acuity of 20/10 temporal atrophy may be compatible with visual acuity of 20/20. The three most important etiologic factors in retrobulbar neuritis are, in order of frequency: multiple sclerosis, myelitis, and sinusitis.

M. Davidson.

12. VISUAL TRACTS AND CENTERS

Balada, M., and Malbran, J. **Surgical optic atrophies.** Arch de Oft. de Buenos Aires, 1935, v. 10, Nov.-Dec., p. 777. (See Section 11, Optic nerve and toxic amblyopias.)

Renedo, J. M. **Fright psychosis. Bilateral amaurosis. Cure by suggestion.** Klin. M. f. Augenh., 1936, v. 96, Jan., p. 107.

After a violent explosion a soldier became blind from a neurosis. Following injections of salt solution at the temporal side of each orbit, and suggestive treatment, his vision was restored.

C. Zimmermann.

"X". **Experiences of a sufferer from word-blindness.** Brit. Jour. Ophth., 1936, v. 20, Feb., p. 73.

This note describes the difficulties and embarrassments of a sufferer who was misunderstood by family and intimates. The sufferer herself did not understand the cause of her many failures and inability to read until the subject of word blindness was explained to her a few years ago by one of the editors of the British Journal of Ophthalmology.

D. F. Harbridge.

13. EYEBALL AND ORBIT

Gutmann, J. H. **The surgical aspects of pulsating exophthalmos.** Internat. Jour. Med and Surg., 1935, v. 48, July-Aug., p. 259.

A case of spontaneous arteriovenous aneurism of the left cavernous sinus with involvement of the contents of the left orbit is described. Recovery followed ligation of the left common carotid artery. The clinical features, pathology, and treatment of pulsating exopthalmos are reviewed.

Edna M. Reynolds.

Rumiantseva, A. F. **Mechanical stretching of the conjunctival sac for introduction of the prothesis.** Sovietskii Viestnik Opt., 1935, v. 7, pt. 4, p. 493.

The author finds that the socket may be gradually stretched to the desired shape and size by introduction of the ordinary prothesis and increasing its size every few days. Ray K. Daily.

Spector, S. A. **Etiology and significance of the ocular symptoms in Basedow's disease.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 5, p. 610.

At the Institute of Experimental Endocrinology in Moscow, the author examined sixteen cases of Basedow's disease with Bielschowsky's prism apparatus. In all cases he found the amplitude of divergence greater than the amplitude of convergence. In all cases of recent exophthalmos in Basedow's disease, he also found tenderness to touch over the tendons of the oblique ocular muscles. This tenderness was absent in exophthalmos due to other causes, and in Basedow's disease with unilateral exophthalmos the tenderness was found only in the involved eye. The author concludes that the exophthalmos is caused by increased tonus in the oblique ocular muscles, which draw the eye out of the orbit; the other ocular symptoms being caused by increased tonus of the muscles in the upper half of the face, due to a disturbance in the

midbrain from infection or change in pituitary secretion. Thus he considers futile any surgical intervention on the sympathetic for relief of ocular symptoms. Rapid and early development of ocular symptoms in Basedow's disease is indicative of primary involvement of the brain centers, and in such cases thyroidectomy is not followed by recession of exophthalmos. Slow and late appearance of ocular symptoms indicates a secondary involvement of the centers in the midbrain, and in such cases thyroidectomy and reëstablishment of normal endocrine metabolism will lead to recovery of function in the midbrain centers and to improvement in ocular symptoms. Ray K. Daily.

14. EYELIDS AND LACRIMAL APPARATUS

Briggs, A. H. **The treatment and complications of chalazia.** Brit. Jour. Ophth., 1936, v. 20, Feb., p. 68.

This condition, being a central necrosis with peripheral fibrosis, is not in most cases effectively treated by simple incision and curettage, but in chronic cases requires dissecting out under novocaine infiltration.

D. F. Harbridge.

Derkač, V. **Plastic repair of lid coloboma.** Klin. M. f. Augenh., 1936, v. 96, Jan., p. 102. (Ill.)

Derkač operated successfully, with imperfect cosmetic result, on a coloboma of the upper lid by the Wickerkiewicz method. In a second case he obtained a very good result by implantation of cartilage from the antihelix.

C. Zimmermann.

Kopp, I. F. **Indications and evaluation of the Hungarian method of blepharoplasty.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 5, p. 603.

The author considers Imre's technique indicated, and most satisfactory, in repairing the nasal portion of the lids, long horizontal defects of the lower lid, and complete loss of considerable portions of the lids.

Ray K. Daily.

Kupreev, C. H., and Nisznik, S. A. **Ionization therapy in blepharitis.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 5, p. 652.

A tabulated report of thirty cases of blepharitis (ten simple and twenty ulcerative) treated with zinc ionization. The satisfactory results lead the author to urge this method of treatment in intractable cases of blepharitis.

Ray K. Daily.

Mohamed, I. A. **Gangrene of lids.** Giza Mem. Ophth. Lab., 9th annual Rept., 1934, pp. 142-147.

The case report is accompanied by pictures and complete bacteriologic findings. A few staphylococci and streptococci and many B. coli-like organisms were found which reproduced the disease in experimental animals. The name B. proteus Giza has been given to this organism. The patient recovered in three months.

Lawrence G. Dunlap.

Ochapovskaja-Patzapai, H. V. **Amyloid degeneration of the ciliary border of the lid.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 5, p. 584.

This is a detailed description of the first such case on record. A review of the literature of the disease in general leads the author to conclude that the local degeneration is a manifestation of general disturbance in albumen metabolism, leading to an amyloid deposit in the tissues. The etiology of local amyloid retention, the pathologic process, and the therapy are still subjects for research. Ray K. Daily.

Rosengren, B., and Kugelberg, I. **The active function of the lacrimal passages in winking.** Klin. M. f. Augenh., 1935, v. 95, Dec., p. 764. (Ill.)

The tear passages have no contractile elements of their own and an active function is only possible from outside by the orbicularis muscle. The authors studied this experimentally by cinematographic registration with a velocity of sixteen pictures per second, read under magnification. There appears to be an actual pumping by the canaliculi,

their lumina being compressed during winking and dilated in the intermissions. The changes in volume of the lacrimal sac under physiologic conditions do not bring about transportation of the tears from the conjunctival sac, but may facilitate evacuation of the sac through the nasolacrimal duct.

C. Zimmermann.

Tichomirov, P. E. **Treatment of epiphora with alchohol injections into the lacrimal glands.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 4, p. 452.

In 57 clinical cases the author obtained 51 percent successful results. Experimental work on dogs confirms the statements that alcohol injections are harmless; that the postoperative reaction subsides in three to five days while the ptosis may last ten to fifteen days; and that recurrence may be treated by repeating the injection. (Photomicrographs.) Ray K. Daily.

Tobgy, A. F. **Plastic operation for restoration of the upper lid.** Giza Mem. Ophth., Lab., 9th annual rept., 1934, pp. 148-150.

The author's method of restoration after complete removal for carcinoma closely resembles the Wicherkiewicz operation. He utilizes a skin and cartilage graft from the ear, covered by a lower-lid pedicle flap.

Lawrence G. Dunlap.

15. TUMORS

Albrich, K. **Contribution to the question of formation of lymph follicles in the eye.** Klin. M. f. Augenh., 1936, v. 96, Jan., p. 51. (Ill.)

A man aged 43 years showed a pigmented spindle-cell sarcoma of the choroid with perivascular infiltration, mostly by lymphocytes and plasma cells, at many places where the blood vessels of the underlying tissue were preserved. Behind the tumor was a zone of cellular infiltration consisting almost exclusively of lymphocytes. This zone was not perivascular but formed a compact mass. The author argues that it is not absolutely necessary to assume a specific infection for the formation of follicles in the eye as is urged by Szily. C. Zimmermann.

Clerici, A. **Nonpigmented cystic nevi of the bulbar conjunctiva.** Arch. di Ottal., 1935, v. 42, Nov., p. 436.

The description carries histologic confirmation. The morphologic and clinical characteristics in other cases are reviewed. (Bibliography.)

H. D. Scarney.

Filippi-Gabardi, E. **Benign melanosis oculi.** Arch. di Ottal., 1935, v. 42, July-Aug., p. 225.

Three cases are reported in detail. (3 col. plates.)

Holm, Ejler. **Osteoma of the orbit.** Det oft. Selskab i Köbenhavn's Forhandlinger, 1934-1935, pp. 19-21. In Hospitalstidende, 1935, Dec. 17.

A woman of 62 years had a left-sided exophthalmos which had first appeared twenty years before. The vision of the left eye had failed gradually and a large flat swelling had developed in the left temporal region. The eye protruded 8 mm. and the eyeball moved freely in all directions. Roentgen films revealed a bony mass in the posterior part of the orbit, and extending to the sella turcica. The diagnosis lay between osteoma, arising probably from the ethmoid cells, and meningioma of the small wing of the sphenoid, with reactive hyperostosis. The latter is characterized by protrusion not only of the eyeball but of the whole orbital contents.

D. L. Tilderquist.

Kapuscinski, W. J. **Routes of metastasis in glioma of the retina.** Klinika Oczna, 1935, v. 13, pt. 4, p. 722.

A very extensive bibliography and a brief review of the literature on glioma are associated with report of the case of a boy of two years who was brought to the clinic with hemorrhage in the anterior chamber and a history suggestive of glioma. The eyeball was enucleated a week later. Orbital recurrence was treated by orbital exenteration and roentgenotherapy. The patient was well three years later. Histologic examina-

tion of the enucleated eye demonstrated extension of the tumor into the orbit through the corneal-paracentesis wound. (Illustrations.)

Ray K. Daily.

Kogan-Abesgus, P. M. **Ocular changes in cranial metastasis of neuroblastoma.** Sovietskii Viestnik Opt., 1935, v. 7, pt. 4, p. 487.

The author reports three cases of neuroblastoma in two-year-old babies, with cranial metastasis. The fundus changes were: bilateral neuritis in one case, optic atrophy in the second, and postneuritic atrophy in the third. The other ocular changes were: in two cases ecchymosis, asymmetric exophthalmos, limitation of ocular movement, and mydriasis; in the third case, mydriasis only. (Illustrations.) Ray K. Daily.

Perrin, R., and Noel. **A case of neuroepithelioma of the retina.** Arch. d'Opht., 1935, v. 52, Nov., p. 814.

A patient (age not given) complained of severe pain of eighteen days' duration in the left eye, which had been blind for two years after a diagnosis of retinal detachment and retinal hemorrhages. Examination showed an eye with acute glaucoma. In spite of the cloudy cornea the retina was seen to be completely detached. The eye was enucleated. Histologic examination showed a small grayish tumor in the posterior portion of the eye. There was no distinct difference between retina and neoplasm. The optic nerve was not involved. Microscopic study revealed strips of cylindric cells arranged around blood vessels (pseudo-epithelial aspect). No typical ependymal rosettes were seen. (Illustrations.)

Derrick Vail.

Rintelen, F. **Fundus changes in tuberous sclerosis of the brain.** Zeit. f. Augenh., 1935, v. 88, Dec., p. 15.

The fundus in a child with tuberous sclerosis of the brain is briefly described. Aside from typical tumors of the retina and optic nerve, colobomata were seen in typical and atypical situations in the fundus. This fact lends some support to the view that the tumors in tuberous sclerosis are to be considered a congenital malformation rather than neoplastic.

F. Herbert Haessler.

Sjögren, Henrik. **Myoblastoma malignum orbitae.** Graefe's Arch., 1935, v. 134, p. 333.

A variety of tumor is reported as occurring for the first time in the orbit, in an eight-year-old boy. Two recurrences were observed after excision of a growth deep under the roof of the orbit. The first recurrence surrounded the supraorbital nerve and the tendon of the superior oblique muscle. Death occurred a few months after a third operation which included exenteration of the orbit. Microscopic examination of all three excised masses presented, in addition to a simple sarcomatous portion, another part composed of large round or oval cells with granular or vacuolated cytoplasm. Among these cells were occasional elongated ribbon-shaped cells, rarely presenting longitudinal or cross striations which suggested a myogenic origin.

H. D. Lamb.

Smoleroff, J. W., and Agatston, S. A. **Two different fundus pictures in metastatic choroidal carcinoma.** Arch. of Ophth., 1935, v. 14, Nov., pp. 809-814.

Two cases of carcinoma of the breast with metastasis to the choroid are reported in detail and illustrated by drawings and photomicrographs. In the first case there was swelling of the optic nerve with a large retinal detachment partially overhanging the disc, and in the second case the fundus showed discrete nodules scattered throughout which slightly raised the retina. The difference in the fundus picture is thought to depend upon whether the malignant cells are carried through the short posterior ciliary or through the long posterior ciliary vessels.

J. Hewitt Judd.

Torgersrud, T. **Several cases of nevus of the conjunctiva.** Acta Ophth., 1935, v. 13, pt. 1-2, p. 77.

From a review of the literature and seven cases of nonpigmented nevus, the

conclusions are that nonpigmented nevi are not so rare as generally believed, and that they should be suspected in the presence of epibulbar tumor in the young. Because of their tendency to malignancy they should be radically extirpated, and for this purpose electro-endothermy is useful. Radium therapy endangers the transparency of the lens, and should be reserved for cases where excision is impracticable. (Illustration.)
Ray K. Daily.

Walsche, L. de. **Ocular leucosarcomas and melanotic propigment.** Bull. Soc. Belge d'Opht., 1935, no. 70, p. 53.

Three cases of leucosarcoma of the choroid were observed. The tissues were subjected to the silver-affinity reaction of Masson, consisting in reduction of the hydroxyl of ammoniacal silver into metallic silver by a reducing substance in the tissue. The conclusion is that the existence of leucosarcoma entirely devoid of pigment has yet to be proved. (Four figures.)
Jerome B. Thomas.

Wernicke, Otto. **Hereditary ocular carcinoma in cattle.** Arch. de Oft. de Buenos Aires, 1935, v. 10, Nov.-Dec., p. 773.

Hereditary transmission of bovine ocular carcinoma among five generations of pure pedigreed animals has been followed up by the writer for twenty years. He has been able to confirm the observations of Voges in 1902 as to its occurrence exclusively in Hereford stock. The tumor is a pavement-cell carcinoma beginning at the limbus, affecting generally only one eye, and very malignant. It has been found only in eyes surrounded entirely by white hair and not in eyes with red hair around them. Transmission is through the female exclusively and is more commonly to females. The remedy suggested is to exclude from reproduction all attacked females and their female descendants. M. Davidson.

16. INJURIES

Alexseeva, V. I. **Magnet extraction.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 5, p. 624.

Tabulated study of 658 cases accumulated during 33 years in the Helmholtz eye hospital in Moscow shows that the majority of injuries by magnetic foreign bodies occur in young people, that the left eye is the more frequently injured, that the most common points of entry are the center of the cornea and the inner portion of the cornea and sclera, and that for evaluation of methods of extraction the patients should be under observation over two years. The final result is conditioned by the location and size of the foreign body, the presence of infection, and injury to the lens. Ray K. Daily.

Benoit. **Intraocular explosion of a foreign body.** Bull. Soc. Belge d'Opht., 1935, no. 70, p. 49.

A small bit of steel from a hammer or file was driven into the eyeball, leaving a small wound in the cornea. Examination of the eyeground with pupil dilated revealed many small foreign bodies divided into two groups, near the surface of the retina. Explosion of the bit of steel after entering the eye may be explained by the fact that very hard steel, such as that of a file, has the property of flying into pieces upon slight resistance.
Jerome B. Thomas.

Benoit. **Ocular reaction produced by an aniline pencil.** Bull. Soc. Belge d'Opht., 1935, no. 70, p. 52.

Puncture of the conjunctiva by an aniline pencil was followed in about ten hours by intense pain, photophobia, and deep corneal edema. The inflammation did not subside entirely for nearly three weeks. Jerome B. Thomas.

Buscmich, D. G. **Industrial ocular injuries in the soda factory at Slavinsk and their prophylaxis.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 5, p. 704.

A statistical study shows a gradual fall in the number of injuries which occurred at this establishment during 1932, and the first half of 1934. To reduce them to an insignificant number the program calls for replacement of the old machines with those of more modern type, improvement in ventila-

tion, equipping workers with respirators and glasses, equipping machines with protective guards, establishment of an ophthalmologic unit in the factory, and an educational unit for the propaganda as to the value of machine guards and protective spectacles.

Ray K. Daily.

Ehlers, Holger. **Injuries to eyelids by hooks.** Det oft. Selskab i Köbenhavn's Forhandlinger, 1934-1935, pp. 11-13. In Hospitalstidende, 1935, Dec. 17.

Lacerated wounds of the eyelids produced by hooks of one kind or another present a typical appearance. The tear begins at the inner canthus and extends in an irregular curve laterally about to the junction of the middle and lateral thirds of the lid. The wound usually involves the lacrimal canaliculus, so that a portion of this remains in the apex of the flap. In repairing the wound, the flap should be stitched back into position with care. It is practically impossible to secure function of the canaliculus. The marginal suture is apt to cut through. To obviate this the following procedure has been used with success: An aluminum-bronze wire is passed through the punctum and the part of the canaliculus on the flap. If the medial end of the canaliculus can be found, the wire is pushed through this and then out through the skin. The ends of the wire are not tied but are fastened to the forehead with tape.

D. L. Tilderquist.

Fischer, F. P. Vermeulen, D., and Eymers. J. G. **The smallest quantity of ultraviolet and infrared light necessary to injure the eye.** Arch. f. Augenh., 1935, v. 109, Dec., p. 462.

The authors found that the first recognizable harmful effect on the eye in ultraviolet radiation was in the reflex image of the cornea, and that in the infrared radiation it was the first detectable turbulence in the aqueous. They radiated the eyeball first with a medium strong intensity, and noted the time in which the first harmful effect took place. Then they increased and decreased the intensity and noted again the threshold time. Time and intensity of radiation gave a constant formula for computing the smallest light intensity and the shortest radiation time that produced a harmful effect. For ultraviolet light it amounts to between one and four million erg-seconds per square centimeter.

R. Grunfeld.

Fuchs, A. **Rare pathologic findings after injuries.** Klin. M. f. Augenh., 1935, v. 95, Dec., p. 721. (Ill.)

With reports of cases and illustrations, Fuchs discusses implantation of epithelium in the subretinal space, unusual foreign-body giant cells, sequels of injuries of ciliary vessels, and nerves at the posterior pole.

C. Zimmermann.

Ješe, L. **Some rare eye injuries.** Klin. M. f. Augenh., 1936, v. 96, Jan., p. 110.

1. A kick over the left eye was followed by an orbital abscess. A shoe nail was evacuated with the pus.

2. A tumor under the right upper orbital margin had grown larger for several months. Upon incision a wheat awn was found embedded in the mass. After subsidence of swelling a small granulation was seen in the upper retrotarsal fold. This was the point of entrance of the beard, which after perforating the conjunctiva had migrated into the orbit.

3. A youth, who a few years previously had had paresis of the right facial nerve with lagophthalmos, slept in a storage room. Suddenly he felt an intense pain in his right eye, touched the eye and detected a rat. In driving it away with his hand he lacerated the anterior segment of the eye, which had been grasped by the teeth of the rat. The eye healed, but after four years had to be enucleated on account of painful phthisis.

4. The sight of an eye hit by a stone had gradually deteriorated. Examination showed conjunctival and ciliary injection, fine corneal opacities, and two caterpillar hairs in the parenchyma. For weeks the migrations of the hairs could be observed with the slitlamp. One penetrated into the anterior chamber, lay on Descemet's membrane, and was removed through an incision.

Another, which had wandered under Bowman's membrane, was removed by incision with the lance keratome. Microscopic examination showed bombyx hairs with hooks and brown medullary cavity. The eye recovered with good vision. C. Zimmermann.

Jusefova, F. I. **Etiology and sequelae of Purtscher's disease.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 4, p. 539.

This report of a case of traumatic angiopathy of the retina with subsequent cystic degeneration of the macula carries a review of the literature of the subject. Ray K. Daily.

Krol, A. G. **The value of X rays in ocular injuries.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 5, p. 710.

Of 64 cases with ocular foreign bodies, roentgenography led to erroneous conclusions in 13. The author emphasizes the importance of taking a frontal and a sagittal plate; of using a contrast mass in doubtful cases, and of taking skeleton-free pictures of fine foreign bodies in the anterior portion of the eyeball. Ray K. Daily.

Lichtner, V. A. **Two cases of cilia in the anterior chamber.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 5, p. 677.

Removal of the cilia was followed by subsidence of inflammatory symptoms. Ray K. Daily.

Middleton, A. B. **Preparedness for acid or alkali burns of the eye.** Illinois Med. Jour., 1935, v. 67, April, p. 357.

All doctors, regardless of the line of practice followed, are urged to be prepared to give first aid treatment for burns of the eye. The necessary neutralizing solutions are listed and treatment outlined. Edna M. Reynolds.

Pipkina, L. I. **A convenient method of blepharoplasty for covering wounds of cornea and sclera.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 5, p. 674.

The method of Kolen consists in overlapping double conjunctival flaps, the free end of each flap being fastened to the base of the other. The merits which the author claims for this procedure are its applicability to central and peripheral wounds, its technical simplicity, and the fact that during healing the shrinkage of the flaps flattens the underlying iris prolapse.
Ray K. Daily.

Plitas, P. C. **Ocular changes produced by ultrashort waves.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 4, p. 442.

This is the ophthalmologist's report of a group study of the effect of ultrashort waves on the organism as a whole and on the various organs. The study was made on cats, because they are genetically closer to the human, and because their eyes and especially the retinas are well developed. The histologic illustrations show that ultrashort waves of great intensity have a deleterious effect on the eye, with greatest injury to retina and optic nerve. The ganglion cells of the retina are most vulnerable, undergoing a loss of tigroid bodies, vacuolization of protoplasm, and shrinking of nuclei. The early degenerative changes in the optic nerve consist of the formation of lacunae.
Ray K. Daily.

Samsonova, T. I. **Rupture of the optic nerve.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 5, p. 673.

The injury was caused by violent penetration of a sharp fork into the orbit. Ray K. Daily.

Sayad, W. Y., Johnson, V. M., and Maust, E. C. **Human parasitization with Gordius robustus.** Jour. Amer. Med. Assoc., 1936, v. 106, Feb. 8, p. 461.

The authors believe this to be the first authentic case of human parasitism by a gordiid worm ("hair eel" or "hair snake") to be reported in the literature. The patient was a white man of 37 years, residing in southern Florida, who had first noticed the presence of a mass at the lower margin of the orbit about halfway between the canthi two months before consulting the oculist. Growth had been slow until one week earlier, when the tissues had rapidly become swollen and inflamed. The mass was

easily removed. Induration and redness persisted for several weeks, although the skin edges healed readily. Full details of macroscopic and microscopic pathology are given.

George H. Stine.

Vogt, Alfred. **Modification of inner pole magnetism for deep-seated fine particles of iron.** Klin M. f. Augenh., 1936, v. 95, Jan., p. 18.

After freeing the conjunctiva at the limbus, Vogt carried the thin tip of the inner pole magnet along the sclera, alternately on the nasal and temporal sides near the disc. He thus mobilized the particle of iron and drew it forward and around the lens into the anterior chamber, whence it was extracted through an incision.

C. Zimmermann.

Wieczorek, Anton. **A case of copper in the eyeball.** Klinika Oczna, 1935, v. 13, pt. 4, p. 764.

Before reviewing the literature the author reports a very unusual case in which a piece of melted brass penetrated the eyeball of a man of 33 years. A year after the injury the eye had a sunflower cataract. Six years later, following physical exertion, the cataract became dislocated into the anterior chamber and caused acute secondary glaucoma. The lens was extracted, the eye became quiet, and an examination of the fundus, hitherto impossible, revealed retinal perimacular exudates behind the blood vessels. The encysted foreign body could be seen in the vitreous and its presence was confirmed roentgenologically. A year later most of the perimacular exudates disappeared, and X ray showed only a trace of the foreign body, which was apparently being absorbed. (Illustration.)

Ray K. Daily.

17. SYSTEMIC DISEASES AND PARASITES

Bulach, X. O. **Ocular involvement in malaria.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 5, p. 646.

The epidemic of malaria in Dagestan in 1933 was characterized by frequent ocular complications. Within the six weeks of the height of the epidemic the author saw twenty cases of keratitis and seven retinal hemorrhages, three of the latter with optic neuritis and two with metastatic ophthalmia. The keratitis was of two types; the herpetic type and parenchymatous iridokeratitis. Attempts to isolate the plasmodium from corneal scrapings and the aqueous were negative. Of the two cases of metastatic ophthalmia one ended in panophthalmitis with perforation of the globe, the other in atrophy of the globe.

Ray K. Daily.

Charles, J. W., and Post, M. H. **Lipodystrophia progressiva with ocular complications.** Amer. Jour. Ophth., 1936, v. 19, Feb., pp. 126-129; also Trans. Amer. Ophth. Soc., 1935, v. 33, p. 141.

Chepurin, H. C. **Ocular affections in alimentary arsenic poisoning.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 4, p. 503.

In 1930 in Krasnojarsk, a number of cases of arsenic poisoning followed agricultural use of Paris green in the fields. The most frequent of the ocular symptoms was intense edema of the lids. Paresis of accommodation, conjunctivitis, neuritis, and retinitis were seen in some cases. The symptoms subsided rapidly after discontinuing the eating of contaminated bread.

Ray K. Daily.

Contino, Filippo. **Cysticercus of the conjunctiva.** Ann. di Ottal., 1935, v. 63. Nov., p. 843.

The author makes a case of subconjunctival cysticercus the basis for study of the biologic changes produced by the parasite as well as the mechanical effect of its presence. He discusses the manner in which it reaches the submucosa and recognizes that further observations will be necessary before this obscure question can be made clear. (One plate, 6 figures, bibliography.)

Park Lewis.

Frank, T. J. F. **Leukemic retinitis: . . . eye changes in 35 cases of leuke-**

mia, . . . with a report of gross papilledema in . . . chronic myelogenous leukemia. Med. Jour. Australia, 1935, v. I, March 23, p. 364.

Hemorrhages were the most frequent abnormal fundus finding, occurring in sixteen cases. Tortuous and dilated veins and arteries were present in nine cases. The bilateral papilledema of 6 D. reported in one case disappeared after X-ray treatment. Papilledema was observed in three other cases.

Edna M. Reynolds.

Kisin, P. E., and Basilevskaja, L. C. **Experiments with cultures in vitro of ocular tissues. The effect of diphtheria toxin on tissue cultures of the iris and ciliary body.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 4, p. 433.

This detailed report, illustrated with photomicrographs, of the author's experiments with cultures in vitro of conjunctiva, cornea, iris, and ciliary body, and of the effect of various dilutions of diphtheria toxin on tissue growth, shows that all dilutions below 10^6 had an inhibitory effect on cultures of the iris and ciliary body. The effect of higher dilutions was inconstant. A large number of cultures were stimulated, in some cultures the growth was arrested altogether, and in a few the growth was inhibited. The ciliary body is more sensitive than the iris to diphtheria toxin. Ray K. Daily.

Schmid, E. **Observations on ophthalmomyiasis.** Klin. M. f. Augenh., 1936, v. 96, Jan., p. 42. (Ill.)

In two cases the larvae of oestrus occurred in conjunctiva and cornea respectively. Instillation of olive oil shortly made the larvae motionless. The slight incidental keratitis subsided the next day. C. Zimmermann.

Wilson, R. P., and Tobgy, A. F. **The ocular complications of the endemic diseases of Egypt.** Giza Mem. Ophth. Lab., 9th annual Rept., 1934, pp. 133-141.

The authors mention schistosomiasis, ankylostomiasis and ascariasis as the most prevalent and important endemic diseases in Egypt, more than one infection often being present at a time. Bilharzia (S. hematobium) the most common helminth, rarely causes eye disease. Ankylostoma (hookworm) has a high incidence accompanied by ocular signs probably due to the concomitant anemia, but the authors doubt whether it causes soft cataract. Likewise the authors disagree with the opinion that trachoma is more severe in patients having schistosomiasis or ankylostoma. Ascariasis patients showed a high incidence of xerosis which may have been due to coexistent trachoma. Leprosy, pellagra, typhoid fever, and ocular myiasis rarely presented ocular complications.

Lawrence G. Dunlap.

18. HYGIENE, SOCIOLOGY, EDUCATION, AND HISTORY

Barkan, Hans. **Ophthalmic errors.** Amer. Jour. Ophth., 1936, v. 19, Feb., pp. 129-135.

Belskii, A. A. **Physical prophylaxis of the organ of vision in air pilots.** Sovietskii Viestnik Opht., 1935, v. 7, pt. 4, p. 511.

A discussion of physical therapy effective in checking incipient pathologic processes in the eyes. Ray K. Daily.

Biernacka-Biesiekierska, Jadwiga. **A report of postgraduate study in ophthalmology in Paris, and of the eye hospitals in Paris and Brussels.** Klinika Oczna, 1935, v. 13, pt. 4, p. 785.

A brief description of the various eye services in Paris and Brussels.

Ray K. Daily.

Brandes, E. **Report on the activities of the international organization for the fight against trachoma.** (Meetings held in London, April 3 and 4, 1935). Bull. Soc. Belge d'Opht., 1935, no. 70, p. 104.

Paper not suitable for abstracting.

Brenta, J. **The Strassburg class for amblyopes.** Bull. Soc. Belge d'Opht., 1935, no. 70, p. 109.

The Strassburg school for the partly blind, founded in 1911, serves a double purpose: (a) to withdraw from the school population children of normal

intelligence whose poor vision prevents their participating with profit in the regular classes; (b) to exclude from institutions for the blind children who would waste on Braille texts their remaining useful vision. A school of the same type has been recently organized in Paris. Two years ago the Société Belge expressed the desire that Belgium might follow the example of England, France, the United States, Germany, and Switzerland in establishing such institutions. Jerome B. Thomas.

Cori, Renzo de. **The antitrachomatous campaign in the eye clinics of Florence.** Rev. Internat. du Trachome, 1935, v. 12, Oct., pp. 205-217.

Special schools for trachomatous children, rigid inspection of school children, education in diagnosis, and adequate treatment with copper sulphate have resulted in decrease in childhood trachoma from 3.19 percent in 1907 to 0.27 percent in 1934. Use of the term "follicle" is discouraged in favor of "nodule." The follicle and papilla occur in non-trachomatous conditions. Anatomically the trachomatous nodule consists of a very delicate fibrillar stroma with aggregates of epithelial cells that are centrally placed and surrounded by lymph cells. With degeneration the contents are evacuated and later replaced by fibrous tissue.
P. J. Leinfelder.

Esser, A. M. **Dicoria in antiquity.** Klin. M. f. Augenh., 1935, v. 95, Dec., p. 802.

Esser quotes from the elder Pliny, Plutarch, Gellius, and Solinus to show that dicoria had not only a medical but also a psychologic-mystic aspect, imparting the impression of a malicious, false, detrimental, and bewitching look.
C. Zimmermann.

Esser, A. M. **The eyes as points of attack by birds and insects in ancient sources.** Klin. M. f. Augenh., 1935, v. 95, Nov., p. 670.

According to ancient authors the eyes of man, cattle, the donkey, and small domestic animals are exposed to the attacks of ravens, crows, bees, and wasps by beak, claws, wings, and stings. Tradition holds that birds chiefly attack the eyes of cadavers, because they see their own pictures in them. C. Zimmermann.

Farhat, R. **Organization of the campaign against diseases of the eye in Tunisia.** Rev. Internat. du Trachome, 1935, v. 12, Oct., pp. 245-248.

Facilities are inadequate. Ophthalmologists are not available, and operations performed often result in loss of vision because of lack of postoperative attention. Suggestions for improvement are given. P. J. Leinfelder.

Fridenberg, Percy. **The beginnings of the Section of Ophthalmology of the New York Academy of Medicine.** Arch. of Ophth., 1935, v. 14, Dec., pp. 890-895.

This address at the fiftieth anniversary exercises outlines the early history of the section and the contributions of the early members and their contemporaries. J. Hewitt Judd.

Gilbert, W. **Richard Deutschmann.** Klin. M. f. Augenh., 1936, v. 96, Jan., p. 114.

An obituary of Richard Deutschmann, who died November 13, 1935, at Hamburg.

Gordon, B. L. **The problem of the crystalline lens.** Arch. of Ophth., 1935, v. 14, Nov., pp. 774-788.

The ideas regarding the anatomy and the physiology of the lens are summarized from the earliest writings of the Greek anatomists at Alexandria to the present time. The various conceptions are shown by drawings.
J. Hewitt Judd.

Greeff, R. **More medical letters of A. von Graefe.** Klin. M. f. Augenh., 1935, v. 95, Dec., p. 797. (See Klin. M. f. Augenh., 1934, v. 93, p. 539, and 1935, v. 94, p. 91; see also Amer. Jour. Ophth. 1936, v. 19, Jan., p. 90.)

Jameson, P. C. **The Brooklyn Eye and Ear Hospital, 1868-1935.** Arch. of Ophth., 1935, v. 14, Dec., pp. 903-908.

This historical sketch includes the story of the founding of the hospital,

the members of the board of directors and medical staff, and the various buildings which have housed the institution. (Photographs.) J. Hewitt Judd.

Kirwan, E. O'G. **The development of ophthalmology in Bengal.** Indian Med. Gaz., 1935, v. 70, March, p. 154.

A roster of the surgeons who have treated eye diseases in Calcutta from 1794 to date is given, together with an outline of the contributions which they have made to the practice of ophthalmology. A summary of the progress made in ophthalmology during the past five years and an analysis of the amount of work done at the eye infirmary of the Medical College Hospitals during this interval is included.

Edna M. Reynolds.

Knapp, Arnold. **History of the Herman Knapp Memorial Eye Hospital.** Arch. of Ophth., 1935, v. 14, Dec., pp. 909-913.

This institution, modeled after the Graefe clinic, was opened in 1869 as the New York Ophthalmic and Aural Institution. In 1873 was started the laboratory in which Weeks later discovered the bacillus named after him. In 1913 the new hospital was constructed, and because it was limited to care of the eye the present title was adopted. J. Hewitt Judd.

Melchior, Agnes. **The training of the senses of blind children.** Acta Ophth., 1934, v. 12, pt. 4, p. 392.

Melchior is a teacher at the children's home of the elementary school for the blind in Refsnees. She points out that only a trained person knows how to compensate for lack of the visual stimulus in developing in a blind child the senses for hearing, touch, taste, and smell. Without such special attention and training the blind child, lacking the visual stimulus, fails to develop the other senses and so labors under an increased handicap. Ray K. Daily.

Paparcone, E. **The decrease of trachoma in Italy.** Rev. Internat. du Trachome, 1935, v. 12, Oct., pp. 200-202.

Trachoma and its complications are diminishing both in number and severity in Italy. In 1911 the index was 81 while in 1934 it was only ten. This is the result of active work in segregation, treatment, and education. The author believes most important help has been derived from recent elimination of "slum" conditions.

P. J. Leinfelder.

Perera, C. A. **Albrecht von Graefe, founder of modern ophthalmology.** Arch. of Ophth., 1935, v. 14, Nov., pp. 742-773.

This biography sketches Graefe's training and habits, the establishment of his clinic, his eventual appointment as professor at the University of Berlin, and the founding of the Archiv für Ophthalmologie and the German Ophthalmologic Society. Graefe's contributions are reviewed, in three periods. The first included studies on squint, muscle action, conjunctiva, amblyopia, and functional testing. The second included papers on iridectomy for glaucoma, embolus of the central artery, optic neuritis and papilledema, and muscular asthenopia. The third included studies on modified linear extraction, intraocular tumors, tubercle of the choroid, and glaucoma. (Bibliography.) J. Hewitt Judd.

Robertson, C. J. **A comparative study of the measurement of the speed of adjustment of the eye for near and far vision.** U. S. Naval Med. Bull., 1935, v. 33, April, p. 187.

This is a continuation of work reported in the July, 1934, issue of the same publication. The author is attempting to work out standards of speed of vision which will be useful in aviation. He finds that the adjustment of far to near vision is markedly faster at all ages than near to far, and that exophoria of 10 diopters or more at 33 cm. slows the speed of adjustment of the eyes. Inequality of visual acuity, not necessarily below the required 20/20 vision, also slows the speed of accommodation. Certain standards are recommended for various age groups,

based upon examination of 249 pilots and 105 nonpilots.

Edna M. Reynolds.

Rostkowski, Ludwig. **On trachoma statistics.** Klinika Oczna, 1935, v. 13, pt. 4, p. 836.

A reply to Koszutski's criticism of the reliability of trachoma statistics in Kalisz. Ray K. Daily.

Samuels, Bernard. **The New York Eye and Ear Infirmary.** Arch. of Ophth., 1935, v. 14, Dec., pp. 896-902.

The history of this hospital is reviewed from its founding in 1820 by Edward Delafield and John Kearny Rodgers to the completion of the present building in 1903. Many interesting facts are recorded about early hospital conditions, the institution of trained nursing, and the membership of the board of directors. J. Hewitt Judd.

Schweinitz, G. E. de. **Some ophthalmic observations based on experience during the past fifty years.** Arch. of Ophth., 1935, v. 14, Dec., pp. 879-889.

The ancient knowledge of ophthalmology is briefly reviewed and the progress of ophthalmology during the past fifty years is discussed as to the management of refractive errors, eyestrain, muscle balance, surgery in the period before cocaine, and ophthalmoscopy. J. Hewitt Judd.

Sexe, Jean. **What I have seen of the campaign against trachoma in Poland.** Rev. Internat. du Trachoma, 1935, v. 12, Oct., pp. 217-241.

This sketch of the author's observations in Poland during 1934 describes in detail: (1) public health defense, (2) mobile red cross units, (3) treatment of trachomatous children, (4) the Polish army in the campaign, (5) the Institute of Hygiene of Warsaw.

P. J. Leinfelder.

Sorsby, Arnold. **Defunct London eye hospitals.** Brit. Jour. Ophth., 1936, v. 20, Feb., p. 77.

This contribution traces the development and fall of a large number of hospitals. The earliest reference to what approached an eye hospital was in 1171. Attached to many of these institutions were distinguished ophthalmic surgeons of their day. The development of many of these special hospitals provoked much angry opposition. The author suggests that no technical perfection of ophthalmic art can compensate for loss to ophthalmic science from too narrow an exclusiveness.

D. F. Harbridge.

Szymanowski, Kazimierz. **Remarks on the school for the weak-sighted in the blind asylum at Byzdoszcz.** Klinika Oczna, 1935 v. 13, pt. 4, p. 833.

The author makes a plea for separate schools for the weak-sighted and reports agreeable results of this work in thirteen inmates of the asylum, who have been educated to live normally.

Ray K. Daily.

Wootton, H. W. **History of the Manhattan Eye, Ear, and Throat Hospital.** Arch. of Ophth., 1935, v. 14, Dec., pp. 914-921.

The development of the hospital is traced from its founding in 1869 to the present time. (Photographs.)

J. Hewitt Judd.

19. ANATOMY, EMBRYOLOGY, AND COMPARATIVE OPHTHALMOLOGY

Gasser, O. **The existence of the hyaloid canal in men and animals.** Graefe's Arch., 1935, v. 134, p. 297.

With fresh pig eyes, a solution of carmine could be successfully dropped into the hyaloid canal. The canal thus colored ran a somewhat twisted course from its funnel-shaped dilatation just in front of the optic papilla to the posterior capsule of the lens, extrapolar or at the place of attachment of the hyaloid artery to the lens. In fetal eyes of cattle, demonstration of the canal is easy. Similar experiments with the eyes of calves and oxen are much more difficult and uncertain than with pig eyes. In the eyes of adult humans, it is impossible to establish the canal's existence, although this can be done readily in fetal and children's eyes. In all, the

author investigated 25 pig eyes, 17 calf and ox eyes, 15 fetal cattle eyes, 6 adult human eyes, an 11-months-old child's eye, and 4 eyes of new-born infants.

H. D. Lamb.

Osterberg, G. **Topography of the layer of rods and cones in the human retina.** Acta Ophth., 1935, supplement 6.

After a review of investigations on the subject and of various histologic methods of study, the author gives a detailed description of the technique he chose, and a tabulated and graphic report of the results obtained in a count of the rods and cones in one normal human retina. The retina was cut into four quadrants and each was fixed in formalin, dehydrated in alcohol, embedded in celloidin, and cut in serial sections of 20 microns. After calculating the shrinkage of the retina, the location of the sections counted was projected on a globe—thus permitting an estimate of the position of the areas counted and their distance from the fovea. The study shows the greatest density of cones, 147,300 per sq. mm., in the center of the fovea. The cone density diminishes regularly and rapidly to the rod line, where it is 74,800 per sq. mm. From here it decreases more slowly but regularly to 3 mm. from the center, where there are 6,000 cones per sq. mm. Peripherally to this zone the density diminishes but little, and remains greater in the upper and nasal part of the retina. At 130 microns from the fovea the rods appear, first in small groups, then in rows forming a net between the cones. The rod count increases regularly and markedly and at 5-6 mm. from the fovea forms a ring-like zone of maximum density of 170,000 rods per sq. mm. From this point the density diminishes toward the ora serrata, where the count varies between 50,000 and 23,000 rods per sq. mm. The calculated number of rods in the retina is between 110,000,000 and 125,000,000 and the number of cones between 6,300,000 and 6,800,000. (Illustrations.) Ray K. Daily.

Poljak, S. **Structure of the retina in primates.** Acta Ophth., 1935, v. 13, pt. 1-2, p. 52.

An illustrated report of the structure of the retina of the rhesus monkey and the chimpanzee, examined with various modifications of the Golgi staining method. The findings throw doubt on some accepted views on the physiology of vision, such as the Schulze-Parinaud-Kries theory. Ray K. Daily.

NEWS ITEMS

Edited by Dr. H. Rommel Hildreth
640 S. Kingshighway

News items should reach the Editor by the twelfth of the month.

Deaths

Dr. William S. Tomlin, Indianapolis, died January 27, 1936, aged 67 years.

Dr. Edwin G. Rust, Cleveland, died December 29, 1935, aged 78 years.

Dr. Thomas Charles Phillips, Milwaukee, died January 4, 1936, aged 76 years.

Miscellaneous

Mr. Lewis H. Carris, managing director of the National Society for the Prevention of Blindness, in a statement issued March 29th, urged public support for two bills introduced recently in the New York State Legislature. One of the bills prohibits the sale of fire works to persons under 21 years of age; the other bill authorizes municipalities to permit "competent persons" to exhibit a display of fireworks when a bond is posted as financial protection for those who may be injured.

A report published by the General Committee of Ophthalmic Welfare Centers for Antitrachoma Work in Cairo for 1935 has been received. This Committee was organized in 1932 for the eradication of trachoma in Egypt. The report is issued in an attempt to further the work.

The Social Security Board on March 31st approved public assistance plans of six

States: the Arkansas State plans for aid to the needy aged, the blind, and to dependent children; the Vermont State plans for aid to the blind and dependent children; the Washington State plan for aid to the blind; the Ohio State plan for aid to the needy aged; the Massachusetts State plan for aid to the needy aged; and the Oklahoma State plans for aid to the needy aged and to dependent children.

As a result of the Board's action these States will receive allotments of funds from the Federal Government to match their own expenditures for assistance to the needy aged, dependent children, and the blind. The Federal grant will be as much as the States themselves spend in the case of assistance to aged persons and aid to the blind, up to a combined total of $30 a month per person, plus 5 percent of the amount of the Federal grant to help cover the States' administrative expenses.

Bound volumes number 1, 5, 7, 8, and 14 of the American Journal of Ophthalmology are available. Write to Drs. C. R. Andersen and E. M. Weaver, 827 First Central Trust Bldg., Akron, Ohio.

The Association for Research in Ophthalmology will meet in Kansas City, Missouri, on May 12, 1936 at Edison Hall, Power and Light Building. The following program will be given:

9:30 a.m.

1. Goniotomy or incision of Schlemm's canal for chronic glaucoma: Results of gonioscopic research, by Otto Barkan, M.D., San Francisco, California.

2. Studies on the action of staphylococcus toxin and antitoxin with special reference to ophthalmology, by Earl L. Burky, M.D., The Johns Hopkins Hospital, Baltimore, Maryland.

3. Precipitins in the ocular tissues of rabbits generally and locally immunized with crystalline egg albumen: Their relationship to allergy, by Richard Thompson, M.D., Eduardo Gallardo, M.D., and Deborah Khorazo, M.D., College of Physicians and Surgeons, Columbia University, New York, N.Y.

4. An investigation of the angular relation of the visual and optic axes, by George E. Park, M.D., Department of Ophthalmology, Northwestern University, Chicago, Illinois.

2:30 p.m.

5. On the nature of the ocular fluids, by Karl Meyer, M.D., Ph.D. and John W. Palmer, Ph.D., College of Physicians and Surgeons, Columbia University, New York, N.Y.

6. Observations on the reducing substances (glucose) of the aqueous and vitreous humors of the eye, by William M. James, M.D. and A. J. Siefker, Ph.D., Washington University, St. Louis, Missouri.

7. Roentgen-ray cataract: An experimental, histologic, and clinical study, by P. J. Leinfelder, M.D. and H. D. Kerr, M.D., The State University of Iowa, Iowa City, Iowa.

8. Iritis produced in rabbits' eyes by the intravenous injection of crude and purified cultures of bacteria isolated from patients with certain inflammatory eye diseases: Preliminary report, by Conrad Berens, M.D., Edith L. Nilson, and George H. Chapman, New York, N.Y.

Societies

The Eye Section of the Philadelphia County Medical Society held the following program on April 2, 1936: Dr. R. S. Minton, Retrobulbar neuritis; Dr. J. M. Rosenthal, Chorioretinitis with unusual characteristics; Dr. Hunter W. Scarlett, Nodular keratitis; Dr. David J. Boon, Hemorrhagic retinitis yielding to removal of focal infection (two cases); Dr. George H. Denny, Detection of pituitary tumor from ophthalmic findings; Dr. Sidney L. Olsho, Retinal angiostenosis in a young adult with suspected pituitary tumor.

Personals

Henry C. Lomb, son of Captain Henry Lomb, co-founder of the Bausch and Lomb Optical Co., Rochester, New York, died on March 15th, at his home, 133 East Eighteenth Street, New York City. He was sixty-three years old.

Friends, colleagues and students of Victor Morax will meet during the Annual Congress of the French Society of Ophthalmology in his memory, and will present his portrait in bas-relief.